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AMERICAN ANTIQUITY

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A PLEISTOCENE CAMPSITE NEAR LEWISVILLE, TEXAS

WILSON W. CROOK, JR., AND R. K. HARRIS

EVIDENCE of human occupation has been found in Pleistocene river terrace strata near Lewisville, Texas, over the past 7 years. Noteworthy finds include a Clovis projectile point in place in the site, an extensive faunal collection, and charcoal which has produced 2 radiocarbon age determinations in excess of 37,000 years B.P. The following article is a condensation of a detailed account appearing in the Texas Archeological Society Bulletin for 1957.

In conjunction with the construction of Lewisville Dam for the Garza-Little Elm Reservoir, the U.S. Corps of Engineers excavated a gigantic borrow pit near the west anchor of the damsite in 1949-51. The borrow pit removed some 20 feet of earth from the local Pemberton Hill-Lewisville (T-2) terrace surface, which originally stood 70 feet above present stream grade. The locality is in extreme southeast Denton County, on the west side of the Elm Fork of Trinity River, just north of Lewisville (Fig. 1).

Beginning with the paleontological collection of the River Basin Surveys salvage work in 1949-51, and followed by the Dallas Archeological Society explorations and excavations in 1952-57, subsequent erosion of the exposed walls and floor of the borrow pit has yielded remains of more than 21 hearths of an ancient campsite of early man. An extensive Upper Pleistocene fauna has been recovered, much of it actually burned within the hearths themselves, and the remainder closely associated as camp refuse, along with certain distinctive artifacts. Theodore E. White, while making the River Basin Surveys paleontological collections at the site, first observed what he considered suggestive indications of the presence of man, and in company with Glen L. Evans and Edward B. Jelks, test-excavated the first hearth discovered.

Besides the writers and Mrs. R. K. Harris, the members of the Dallas Society who have participated in the finds and excavations since 1951 are: Joan Ablon, Herschel N. Cobb and Mrs. Cobb, Lloyd Harper and Mrs. Harper, Henry Hanna, Linda Harris, Robert C. Hatzenbuhler and Mrs. Hatzenbuhler, J. B. Merritt, John Perkins and Mrs. Perkins, E. J. Ruhland, J. B. Sollberger, Lester Wilson and Mrs. Wilson.

In addition, Richard E. Johnson, president of the Tarrant County Archeological Society, aided in the first and ensuing excavations. Almost the entire membership of the Tarrant Society, including Tom Dawson and Mrs. Dawson, R. E. Forrester, John J. Henlein and Mrs. Henlein, C. W. Worthington and Mrs. Worthington, joined the later excavations. Parker Willingham of Denton, Texas, has been another steady digger and an important contributor to the faunal collections, especially.

Professional visitors and helpers include Alex D. Krieger, then Archeologist for the University of Texas and currently Director of the Municipal Museum in Riverside, California, who advised and helped plan the initial excavations of the Dallas Society; Jack B. Hughes, Curator of Archeology at the Panhandle-Plains Museum in Canyon; E. H. Sellards, Director of the Texas Memorial Museum in Austin; F. W. Miller, Curator of the Dallas Museum of Natural History; E. S. Barghoorn of Harvard University and paleobotanical consultant to Humble Oil and Refining Co.; Weldon Whitaker of Humble's Houston Research Center, who so painstakingly prepared the several radiocarbon samples; Charlie Steen of the National Park Service, Santa Fe; and J. L. Mahon, Secretary of the Alabama Archeological Society.

The Fort Worth District Office of the Corps of Engineers, in the person of Ray H. Runder, furnished permission for excavation, and also supplied an invaluable contour map of the vicinity. Hence Griffith and Mrs. Forrest Kirkland, both of Dallas, provided the artifact illustrations.

Excavations and Discoveries. Fortunately, the removal of some 20 feet of the terrace surface by power machinery for the dam fill, combined with the extensive and rapid erosion of the bare borrow-pit walls and floor, allowed necessary excavations to be concentrated upon individual hearth areas as they were progressively exposed over a 5-year period. Although much of the material, archaeological and paleontological, was thus collected piecemeal over several years, an accurate master plat of the site was maintained. From this plat (Fig. 2 A) it can be readily seen that all discoveries

FIG. 1. Denton County, Texas, with location of Lewisville site. Elm Fork of Trinity River is also shown.

are closely clustered in the immediate hearth area.

Counting White's test hearth (particulars detailed in personal communication), thirteen of 21 definitely located hearths have been excavated and recorded; three were lost by erosion, two were looted by unknown persons, and three still unexcavated hearths were destroyed by the rise of the lake which covered the site in April of 1957. Generally, the hearths were shallow, ovoid-to-elliptical basins, ranging from approximately 30 inches in diameter and 8 inches in depth, to as much as 8 feet in diameter and 2 feet in depth. The hard, red-burned appearance of the hearths, with included charred bone fragments and ash-and-charcoal beds, contrasted sharply with the yellow sandy clay of the surrounding matrix.

As discussed more fully in the geologic section, this yellow sandy clay matrix constitutes the local Upper Shuler subformation of the Pemberton Hill-Lewisville terrace. The Upper Shuler subformation was apparently the result of successive deposition of some 7 individual layers of similar material. Each layer surface forms a minor unconformity, with its own period and zone of caliche development. All hearths were located upon some one of these layer surfaces. Numbered from bottom to top, 3 hearths were located at the Layer 1 surface, 13 hearths (including White's) occurred at the most common level at the Layer 2 surface, one at the Layer 3 surface, and four at the Layer 5 surface.

Hearth 1, on the Layer 2 surface, was the largest and most important one. Exposed by sheetwash erosion in the floor of the borrow pit, Hearth 1 appeared as an irregular circle measuring 8 by 10 feet, with a red-burned basin to a depth of 18 inches maximum. Twenty-five 5-foot squares were staked by compass and excavated by hand trowel, after a north-south test trench was first cut to a depth of 2 feet. Square 13, almost entirely within the burned hearth area, yielded a Clovis projectile point actually in place in the red-burned hearth clay and a pocket of "charred, fibrous, vegetable material" which yielded the first of the 2 radiocarbon dates from the site. Hearth 1 also contained a large ash bed in Square 12, and a large number of burned faunal remains from various squares, including horse, deer, wolf, prairie dog, rabbit, terrapin, bird, as well as mussels, snails, and hackberry seeds (Fig. 2 *B*, *C*; Fig. 5).

Hearth 8, also on the Layer 2 surface, was small, measuring roughly 28 inches in diameter by 7 inches deep at the center. It is noteworthy for the 4 small logs of excellent charcoal it contained, which yielded the second radiocarbon date for the site. Also included were charred remains of terrapins, mice, rats, snails, and hackberry seeds (Fig. 5).

Hearth 4, also upon the Layer 2 surface, in reality consisted of 3 successive hearths. Each had been dug at almost, but not quite exactly, the same spot. The 3 superimposed pits also contained some fine charcoal logs; charred mice bones; charred limb bones of an animal the size of horse, bison, or camel; burned fragments of a large eggshell, terrapin, and snails; and charred hackberry seeds. Closely adjacent to Hearth 4 were remains of deer, prairie dog, rabbit, skunk, raccoon, mole, packrat, bear, and peccary. Hearth 4 measured approximately 67 inches by 59 inches across, with maximum depth of 33 inches. The 3 individual pits were of varying width and depth.

Description of Artifacts. The Clovis projectile point found in place in Hearth 1 is of opaque white flint and, despite obvious shattering and repointing on the proximal end, still measures 82 mm. in length. Width at the widest point is 33 mm., and the thickness at midpoint is 8.5 mm. (Fig. 6 *A*, *B*, *C*.)

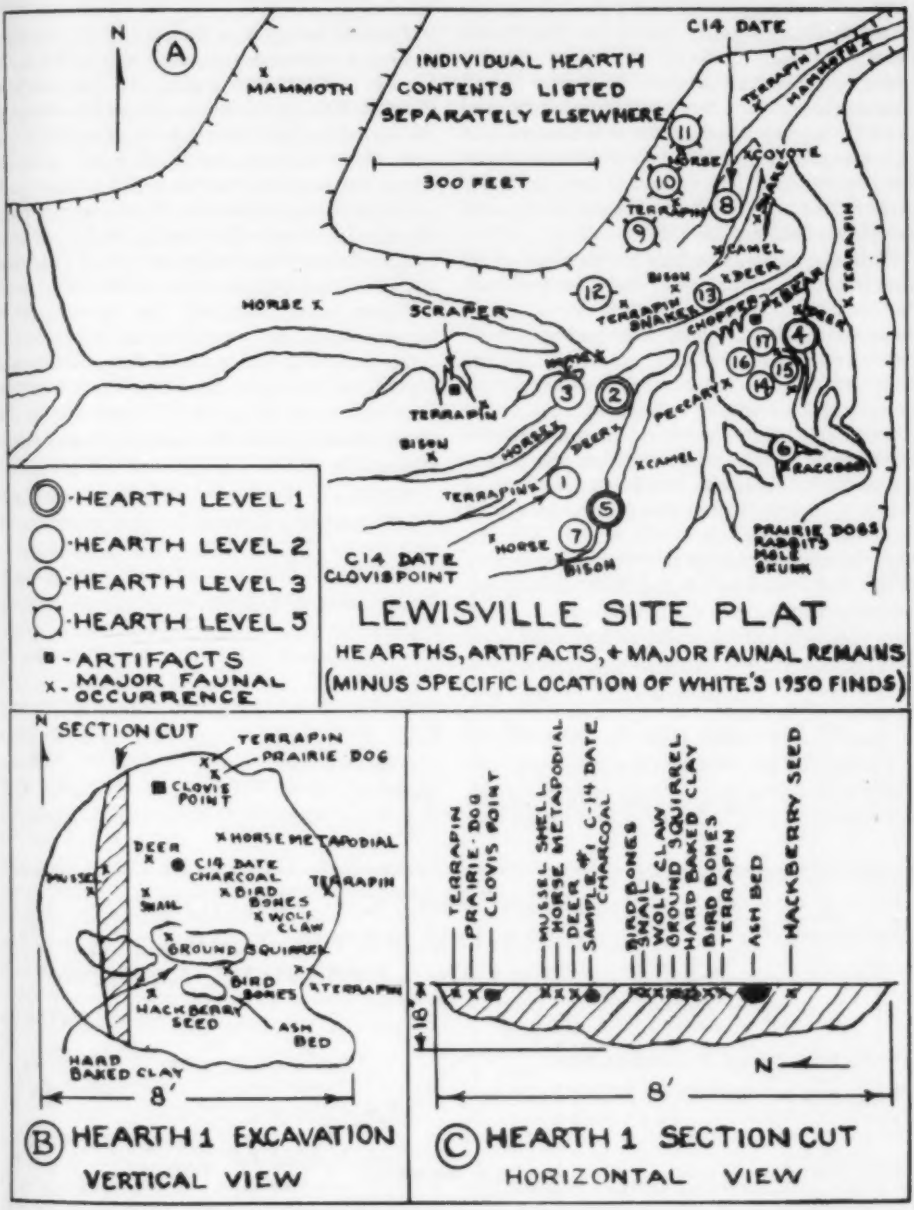

FIG. 2. A, simplified excerpt from master plat of most important discoveries at Lewisville site, 1951-57; B, plan of Hearth 1; C, profile of test trench at Hearth 1.

In comparison with the published descriptions of excavated Clovis projectile points (Angus, Dent, Miami, Clovis or Blackwater Draw, McLean, and Naco), the Lewisville specimen falls well within the limits for all measurements. On the basis of its width and probable former length, prior to shattering and repointing, it would still fall within the limits but classify as a *large* Clovis. Detailed comparisons are reported in the Texas Archeological Society Bulletin for 1957.

Fluting consists of a true partial-flute of 29 mm. in length on one side, and a broken half-flute of 32 mm. in length on the opposite side. From examination, faulty fractures appear to have thwarted 2 separate attempts to flute the latter side. Edges are ground across the base, 40 mm. up one side of the base, 32 mm. up the other side. A thin coat of caliche encrustation covered the point, particularly on the down-side as found. Since this caliche was not burned red, it is indicative that the caliche formation occurred after the use of the hearth. On the other hand, red-burned hearth clay is present in the tiny fractures of the flint, defying attempts to remove it in the laboratory.

In addition, a crude chopper fashioned from a gray quartzite cobble was found newly eroding out of the Layer 2 surface only 15 feet from the group of hearths known as Numbers 14, 15, 16, and 17. The coarse cobble crust is retained as a hand-grip at the top. A typical quartzite cobble field occurs as a remnant of a higher terrace formation just half a mile west of the site, and the chopper may well be derived from this source. (Fig. 6 *F*, *G*.)

Heavily battered at both ends, a crystalline quartzite cobble hammerstone was found newly eroded out in a small gully 10 feet south of White's bison excavation. Its source may also be the cobble field to the west (Fig. 6 *D*).

A flake scraper, finely chipped along its edges, occurred in another small erosion gully on Layer 2, approximately 50 feet northwest of Hearth 1. It is made from a broken flake of opaque white flint, similar to but not identical with the flint of the Clovis point (Fig. 6 *E*).

Three flakes complete the artifact assemblage. One of opaque white flint occurred as a Layer 2 surface find some 15 feet southwest of Hearth 1. The other two, both of gray quartzite, occurred upon the eroded Layer 2 surface between Hearth 1 and the horse teeth and jaw to the northwest.

Geology of the Site. As illustrated in Figure 3, and described in detail in other publications, the Upper Trinity River system possesses a well-marked sequence of 5 alluvial terraces. From lowest to highest, with their general elevations (in feet) above present stream grade, they are termed the Union Terminal-Carrollton (40-50); Pemberton Hill-Lewisville (60-70); Travis School-Farmers Branch (80-90); Love Field-Bethel (100-110); and Buckner Home-Hackberry Creek (120-150). When numbered as in Nebraska, they become T-1, T-2, T-3, T-4, and T-5, respectively. The flood-

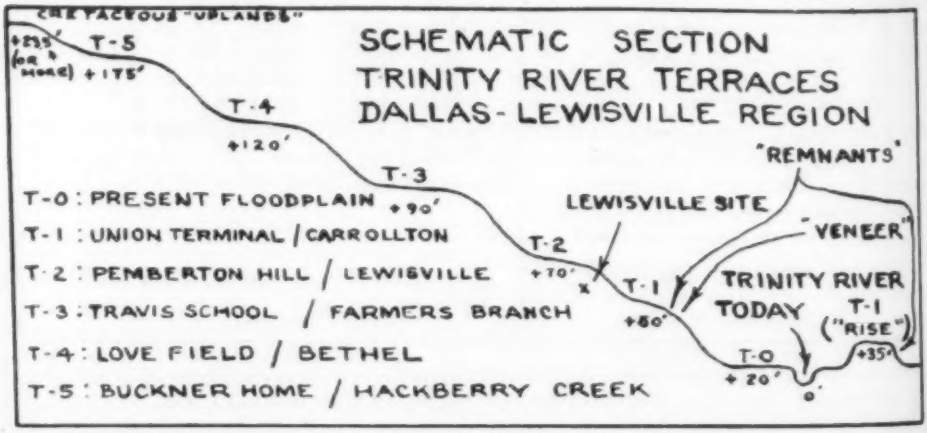

FIG. 3. Upper Trinity River terrace system, generalized.

plain, T-0, is from 10 to 20 feet above present stream grade.

Lying in the north portion of the Gulf Coastal Plain, this terrace sequence has been locally closely correlated with similar evidence on the Red River to the north, the Sabine in its upper reaches to the east, and the middle reaches of the Brazos and Leon rivers to the south and southwest. More importantly, the sequence has been correlated with the classic work of H. N. Fisk and others in adjacent Louisiana on the mid-reaches of the Red and Sabine (Fisk 1938; Martin and others 1954).

As a result, the Pemberton Hill-Lewisville (T-2) terrace of the Trinity system is equated with the Prairie terrace member of Fisk. This is the terrace formation in which the Lewisville site occurs.

The theory of eustatic change in sea level, due to the impounding and release of water by the alternate waxing and waning of glaciations, has been proposed by many writers for the development of terrace systems of such low-gradient streams as flow across the Gulf Coastal Plain at relatively low elevations. The Trinity at Dallas, just downstream from Lewisville, has an elevation of but 363 feet above sea level and a present gradient of only 8 inches per mile. Fisk, in particular, endorses this theory as the cause of the Louisiana terrace sequence, correlated above with that at Lewisville. Thus, in theory, terraces of such streams represent relict remnants of floodplains deposited essentially in *interglacial* times, and valley cutting and trenching correspond essentially to *glacial advance periods*. Nothing known from the geology of the alluvial terraces along the Trinity, including those in the immediate Lewisville area, conflicts with this assumption.

Fisk's correlation of the Louisiana terraces with the events of the Pleistocene follows:

Postglacial.....	Recent Alluvium
Late Wisconsin.....	Erosion Interval
Peorian.....	Prairie member*
Early Wisconsin....	Erosion Interval
Sangamon.....	Montgomery member
Illinoisan.....	Erosion Interval
Yarmouth.....	Bentley member
Kansas.....	Erosion Interval
Aftonian.....	Williana member
Nebraskan.....	Erosion Interval

*Correlative of Pemberton Hill-Lewisville

"Peorian" may, or may not, now be good usage, but Fisk differentiated between an *Early* Wisconsin and a *Late* Wisconsin, separated by a major interstadial to which he attributed the Prairie terrace. It is perhaps remarkable that an interstadial could produce a terrace of a magnitude comparable with those deposited in previous interglacials, but such may be the case. Disregarding for the moment the unestablished theory of 5 Pleistocene glaciations, with 4 intervening interglacials, it is certain that the Prairie and Pemberton Hill-Lewisville terraces were deposited as floodplains prior to the *last* major glacial event of the Pleistocene, whether "Late Wisconsin" or otherwise. On the Trinity, the general fauna of the many exposures of the Pemberton Hill-Lewisville (including the Lewisville site itself) is unquestionably Upper Pleistocene with an abundance of extinct forms to support any of these several possibilities.

Typically, the Pemberton Hill-Lewisville terrace is composed of 4 distinctive subformations

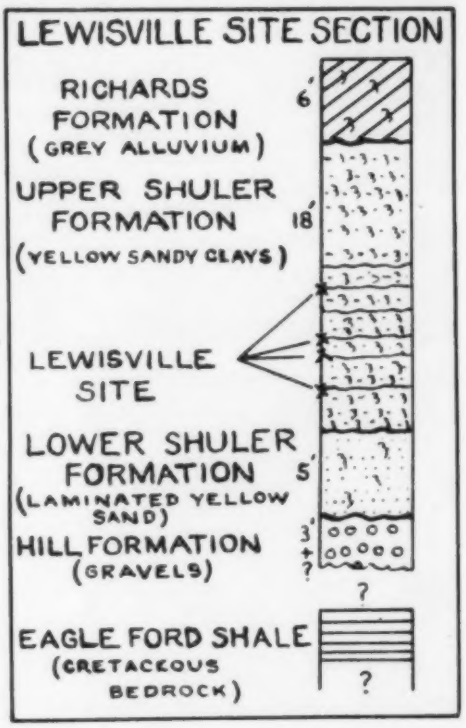

Fig. 4. Section of Pemberton Hill-Lewisville terrace at the Lewisville site, center exposure.

as follows, from base to top: the Hill gravels, the Lower Shuler laminated yellow sands, the Upper Shuler yellow sandy clays, and the capping Richards dark gray alluvium. From many recorded exposures, the Hill gravels are usually topped by a foot or so of conglomerate, cemented by iron solution; included fossils have been identified as *Mammuthus imperator, Mastodon ?americanus* (very rare), *Bison alleni, Equus* cf. *fraternus, Equus scotti, Camelops* (sp.), *Smilodon* cf. *fatalis, Odocoileus* (sp.), a huge *Testudo* (sp.), and fragments referable to some form of ground sloth.

The Lower Shuler finely laminated yellow sands contain some horizontal platelet caliche, from which caliche root casts often depend, plus local bands of manganese stain. Included fauna are *Mammuthus imperator, Mammuthus columbi,* a large Bison (sp.), *Equus* (sp.), *Camelops* (sp.), *Odocoileus* (sp.), a large *Testudo* (sp.), *Smilodon* (sp.), *Vulpes* (sp.), ground sloth, rabbit, fresh-water gar and carp, terrapin, and unidentified birds.

Composed of yellow sandy clays, the Upper Shuler subformation is heavily calichefied, both in vague whitish "zones" and in heavy charges of medium-to-large nodular concretions. It is commonly subdivided into successive layers of similar lithic composition, separated by minor unconformities. Faunal inclusions from localities *other* than Lewisville are as follows: *Mammuthus columbi, Camelops huerfanensis dallasi, Tetrameryx shuleri, Equus complicatus,* a large *Bison* (sp.), *Odocoileus* (sp.), *Canis* (sp.), *Terrapene ?canaliculata,* and *Homo sapiens* (heavily mineralized, partial skeleton from the Lagow Sand Pit as described in Shuler 1923). The Lewisville faunal group is de-

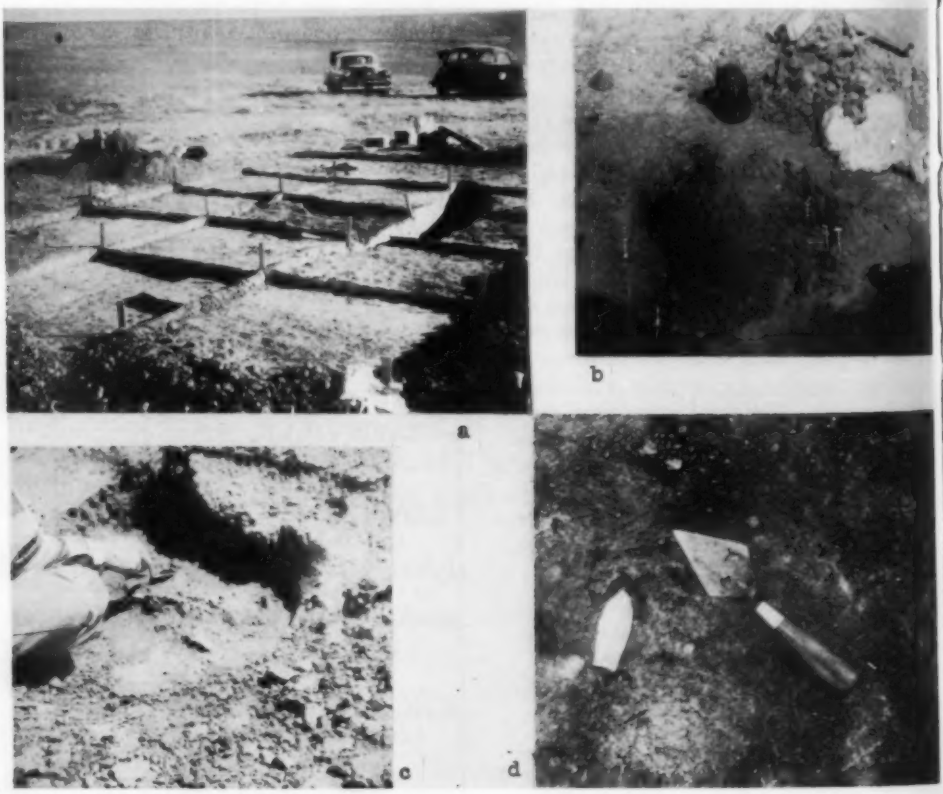

FIG. 5. *A,* completed excavation of Hearth 1, Lewisville site; *B,* Hearth 8 as excavated, showing masses of charcoal which produced second radiocarbon date; *C,* excavation of Hearth 2, in process; *D,* Clovis point in situ.

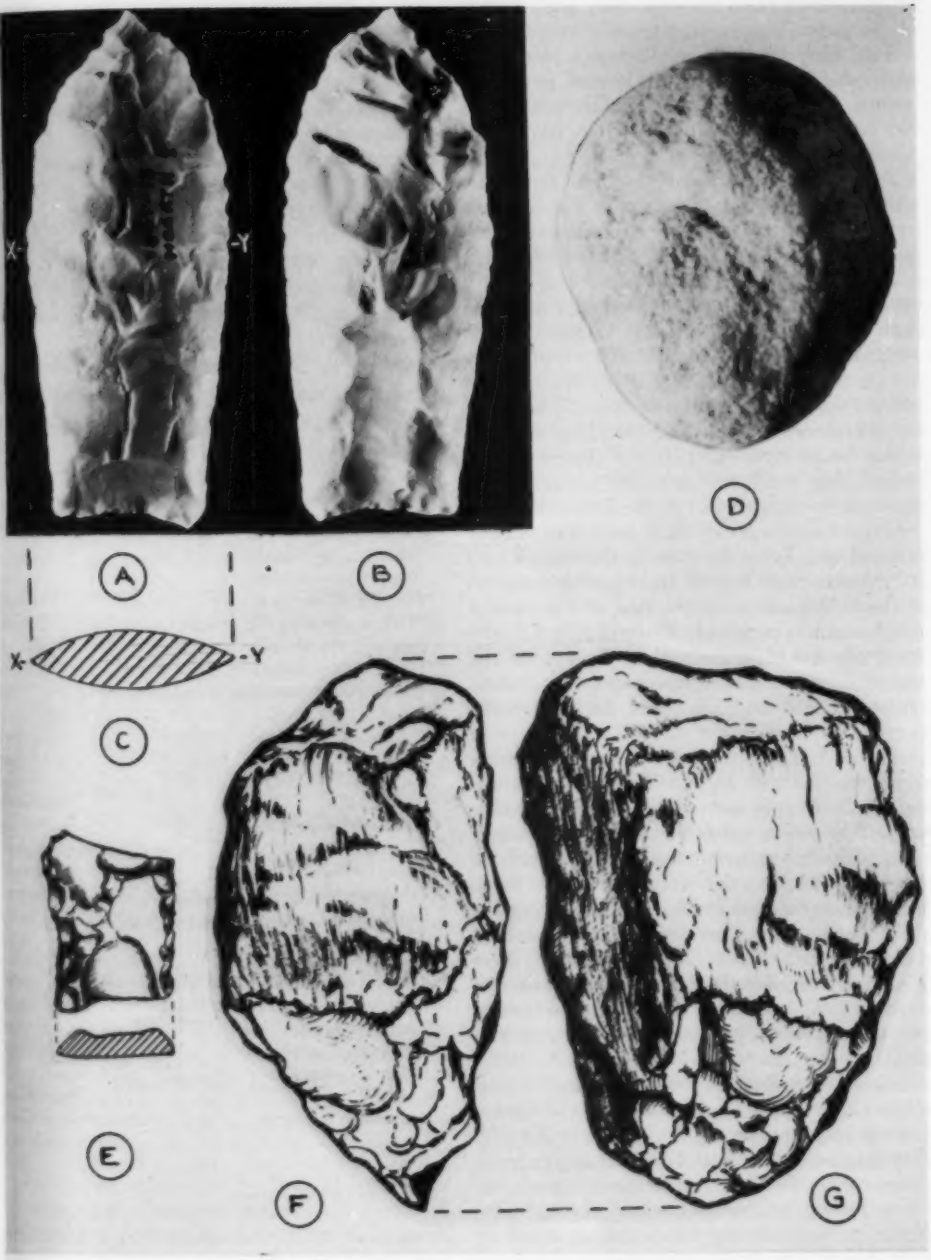

FIG. 6. *A*, Clovis point found in Hearth 1, dorsal view as discovered; *B*, the same, ventral view as discovered; *C*, section of Clovis point at line *x-y*; *D*, hammerstone; *E*, flake scraper, dorsal and sectional views; *F*, *G*, Lewisville chopper, 2 views. All natural size.

scribed in detail in the paleontological section of this paper.

The Richards subformation is a dark gray alluvium, obviously locally derived and redeposited, with tiny caliche nodular concretions. No faunal remains are known to have been observed.

A section of the Pemberton Hill-Lewisville terrace at the actual Lewisville site is illustrated in Figure 4. The key subformation, containing the evidence of the Lewisville site, is the Upper Shuler yellow sandy clay with a maximum thickness (as illustrated), near the center of the locality, of some 18 feet. This is subdivided into some 7 distinct layers of highly similar material, undoubtedly the result of recurring depositional cycles of sporadic and unknown timing. Each is separated from the preceding by an erosional hiatus of undetermined length that produced a minor unconformity and caliche formation (progressively more accentuated upwards) at each successive temporary surface, from the base to the top. There is evidence, from the tilt and varying thickness of the subformation layers, that at the time of the human occupation of the Lewisville site there was a stream channel to the *west* of the site area, yet today the present channels of both Hickory Creek and Elm Fork lie well to the east of the site.

All but 5 exposures of the Upper Shuler subformation in the Upper Trinity region are devoid of faunal and archaeological remains; but of these five, *all* offer unusual concentrations of faunal material, and *four* have yielded suggestive evidence of the presence of man. In the case of Lewisville, without exception all of the numerous archaeological and faunal discoveries have been closely associated, areawise, with the described hearth locations, the remaining 90% or more of the exposed borrow pit being essentially sterile of remains of any kind.

Faunal and Floral Identifications. Various sources have most kindly aided in the identification of materials from the Lewisville site. The following lists and brief discussion summarize their findings; all materials were recovered from hearth features in charred condition, or were closely associated with one or more hearths in the vicinity and at the same level or "layer" surface.

By personal communication, White summarizes his original paleontologic salvage work for the River Basins Surveys (specimens now in the U.S. National Museum):

A bison skull and 4 cervical vertebrae have not yet been unpacked and studied, but some observers at the time of excavation felt that because of the size and straightness of the horn cores that it probably belonged to the *Bison antiquus taylori* group. White also collected a horse jaw, *Glyptodon* scutes, and carapace fragments of the *"Gopherus"* type turtle. In his excavation of the first hearth, a charred horse vertebra, charred deer bones, charred bones of packrat, and burned hackberry seeds were recovered.

Morris K. Skinner of the Frick Laboratory, American Museum of Natural History, graciously undertook the lion's share of the paleontologic identifications. His assessment of materials submitted by the Dallas Archeological Society is as follows:

Canis species (large)	wolf
Canis species (small)	coyote
Euarctos species (small)	bear
**Platygonus ?alemanii*	peccary
Procyon ?lotor	raccoon
Mephitis species	skunk
**Equus* species (large) caballine group	horse
**Equus* species (medium) caballine group	horse
**Bison* (?)	bison
Odocoileus virginianus (small) *A*	deer
Odocoileus virginianus (large) *B*	deer
**Camelops*	camel
*Proboscidian	mammoth
Cynomys ?ludovicianus	prairie dog
Citellus	ground squirrel
Sciurus	squirrel
Sylvilagus species	cottontail
Lepus species	jack rabbit
Neotoma species	packrat (woodrat)
Peromyscus species	white-footed mouse
Microtus species	meadow mouse
Scalopus ?aquaticus	mole
**Testudo* (large)	tortoise
**Terrapene* (large)	box turtle, large
Colubrid group *A*	snake, small
Colubrid group *B*	snake, large
Amphibian or Reptile	frog or lizard
Pisces	small fish
Aves	bird

*Extinct or probably extinct

A number of the somewhat vague identifications are due to the fragmentary nature of the material furnished. *Bison* (?) is based on a fragmentary tooth; bison teeth are not considered diagnostic for specific identification.

"Proboscidian" is based on 2 separate occurrences, a femur head and one tusk; specific identification is not possible to a particular mammoth type.

At Skinner's insistence that the turtle fauna and a number of the small mammals be submitted to specialists in these lines for further investigation, the following additional reports were secured, mainly due to his kind intervention.

Thomas M. Oelrich of the University of Michigan identified the turtle material as:

**Testudo* species
**Terrapene canaliculata* Hay

*extinct

Due to the fragmentary nature of the *Testudo* carapace remains, specific identification was not possible.

Claude W. Hibbard of the Museum of Paleontology at the University of Michigan identified the small mammals as:

Mephitis mephitis.....striped skunk
Procyon lotor.....raccoon
Cynomys ludovicianus.....prairie dog
Scalopus aquaticus.....eastern mole
Sciurus niger.....fox squirrel
Microtus species.....meadow vole
Peromyscus gossypinus.....cotton mouse
Peromyscus leucopus or *maniculatus*.....
.....white-footed mouse or deer mouse
Sylvilagus floridanus.....eastern cottontail rabbit
**Lepus* (new species?).....jackrabbit family

*possibly extinct

On a field trip to the Lewisville site exposure a Southern Methodist University geology student found the articulated skull, jaws, and vertebrae of a grass snake eroding from the general Layer 2 surface in the site area. As submitted by John W. Harrington of S.M.U., W. F. Foshag of the Smithsonian Institution identified the specimen as follows:

Family *Colubridae*, marked similarity to the genus *Drymarchon*.

Molluscan inclusions, all burned within the hearths, have been identified by Elmer P. Cheatum of Southern Methodist University, as follows:

Fusconaia cf. *Undata* (Barnes)
Quadrula frustulosa (Lea)
Amblema plicata

Gastropods, present in quantity only as burned material within the hearths themselves, have been identified by Cheatum and his collaborator, Henry van der Schalie of the University of Michigan, as follows:

Stenotrema monodon (Rockett)
Stenotrema monodon aliciae (Pils)
Anguispira alternata (Say)
Polygyra cf. *Texasiana* (Moricand)
Mesomphix species

Finally, miscellaneous materials include a burned mud dauber wasp nest and charred pupae from Hearth 2; presence of crayfish at the time of occupation, suggested both by small, caliche-filled crotovinas (versus the larger ones attributed to prairie dogs), and the identification in the paleontologic remains of raccoon, an animal known to prefer crayfish as an item of diet; and lastly, the large number of burned hackberry seeds in the hearths attesting to the presence of trees of the *Celtis* family.

Several significant aspects of the identified fauna and flora need further emphasis. By far, the most common fossil materials at the site, in or out of the hearths, have been of turtle. Of these, both the large *Testudo* and the *Terrapene canaliculata* (comprising 95% of the turtle fauna and almost 50% of the total faunal remains) are extinct, and White's *Gopherus* type is today absent from the region. All present-day living relatives of the *Testudo* group are confined to the Central and South American tropics, a strong indication that at the time of the Lewisville occupation the climate was warmer than that of today, which in turn is considered to be a modern interstadial/interglacial/or new warm epoch.

The living peccary (*Pecari angulatus*) probably extended over most of Texas, the southwest corner of Arkansas, and parts of southern Arizona in very recent historic and prehistoric times. Presence of its presumed ancestor, *Platygonus alemanii*, at Lewisville suggests a climate certainly no more rigorous than that of today. That this extinct form is also recorded as far north as Kentucky as a fossil may possibly be attributed to interglacial northward extension of range in excess even of recent times.

Fossil records of *Glyptodon* seem restricted to the southern United States in general. This may also be connected with extreme northward extensions of range during warm, interglacial climates. A modern cousin, the armadillo, was

but recently restricted to southwest Texas and southern Arizona, southward through Central and South America. Today, with the present warming trend, it is busily extending itself into north Texas, southern Oklahoma, and the Gulf Coastal states.

All other members of the identified faunal and floral family at Lewisville suggest a generalized, warm-temperature climate, such as exists today. Certainly no cold-loving forms are present.

Some may argue that, this far south, true cold, glacial climate representatives are not to be expected. This supposition is partially refuted by the pollen analysis of the Patschke peat bog, just east of Austin, Texas, containing pollen grains of fir and white and black spruce (Potzger and Tharpe 1947) attributed to the last major glacial advance period of the Pleistocene (Wisconsin?). The Patschke peat bog is some 200 miles *south* of the Lewisville site.

The snail fauna identified is remarkable in that neither of the 2 most common species in the region today are even present, while, in general, those found belong today to moister, woodland regions. Living representatives of the identical species identified in the Lewisville hearths are today found most commonly in the "Big Thicket" of southeast Texas, a relict, subtropical "pocket," and around the springs at San Marcos, Texas. This latter is another relict, subtropical, moist area preserved by the famous springs which also maintain a growth of cypress trees and palmetto, known as the Texas Palmetto State Park. Both instances suggest a warmer, and perhaps moister, climate than today at the time of the Lewisville occupation.

Of the mussels present, *Amblema plicata*, in particular, preferring ooze and muck, suggests sluggish, mucky water, that might indicate oxbows and cut-off channels at the time of Lewisville. This, in turn, reinforces the previous assumption of a braided, choked floodplain, essentially at very low gradient. Such might well be expected during an interstadial or interglacial time on a low-elevation, low-gradient, coastal plain stream such as the Trinity.

While the identified presence of large mammals requiring lush growth of grass, the woodland-type snails, and the geologic evidence of flooding all argue for a more moist climate than at present in the region, the proven presence of prairie dogs and the formation of major caliche in the soil also suggest *dryer* conditions, from time to time. Caliche formation today is considered to be a function of truly arid regions, but this may be relative. At the time of Lewisville, for example, precipitation may have been actually somewhat greater than today, but if the average temperature were as warm as, or warmer than, that at present in the area, evaporation might also have been greatly increased. Thus the *net* precipitation might have been sufficiently low at times to produce caliche (and attendent, periodic, "dry" environment for the fauna), even though the actual annual rainfall might have exceeded that of today.

Radiocarbon Datings. Through the generosity and cooperation of the Humble Oil and Refining Company, Production Research Division, Houston, the Lewisville site materials have yielded 2 radiocarbon age determinations. These are the first to be associated with the Clovis projectile point type and, thereby, possibly with the Llano complex. Especial thanks and appreciation are due H. N. Fisk, Director; C. R. Horcutt, Assistant Director; H. Dayton Wilde; Milton Williams; and Weldon Whitaker, for many courtesies and invaluable services. Williams provided most of the contact work and Whitaker processed the samples.

Lewisville Sample No. 1 (Humble 0-235, Brannon and others 1957) occurred in place in Square 13 of the Hearth 1 excavations as a rich pocket of carbonized material, roughly 3 inches in diameter and 7 inches long, in the strongly red-burned hearth clay. This was but 20 inches south of the Clovis point, in tight association, at the same level. The charred material actually extended a few inches deeper into the hearth clay due to an inclination of the pocket. E. S. Barghoorn, consulting paleobotanist for the Humble Company, identified the carbonized material as "charred, fibrous, vegetable material" as opposed to ordinary wood charcoal. The date determined for this sample is expressed as being "more than 37,000 years B.P."

Lewisville Sample No. 5 (Humble 0-248, Brannon and others 1957) came from the charred remains of 4 small logs in Hearth 8. After the surprising result of the first dating, Barghoorn and Whitaker were flown to the site to personally select a sample of different provenience for check-dating purposes. According to Barghoorn, the charred logs were unquestionably "wood charcoal" and of such purity that only hand-sorting and routine processing were

required for a sample run. Geologically, Hearth 8 should be contemporaneous with Hearth 1, as it occurred upon the same Layer 2 surface, approximately 300 feet to the northeast. A relatively continuous sequence of hearths and associated faunal remains connect the two over the intervening area, and Hearth 8 itself is centered among several other hearths and paleontologic finds, including White's original bison excavation. The date for this sample is likewise expressed as being "more than 37,000 years B.P."

The absolute argeement of 2 different dating runs, based upon 2 different carbon samples, of different materials, from 2 different hearths in the site, is considered to be significant. Essentially both are beyond the effective range of the counting apparatus, and the dates themselves are simply minimum expressions.

Considerable quantities of charcoal from these 2 locations and from other hearths have been preserved for possible future cross-checking at other laboratories, and for rechecking should the radiocarbon method be extended or improved in years to come.

Comparisons With Other Sites. Situated as Lewisville is, down off the High Plains in a Gulf Coastal stream alluvial terrace, and far removed from any direct connection with glacial effects, either continental or alpine, comparisons with other Clovis projectile point finds are difficult. Of all the described localities, only Dent, Colorado, and the Blackwater Draw site near Clovis, New Mexico, offer possible similarities. As these 2 sites have been visited by the writers, the observations are first hand:

1. *Dent.* Here, 2 Clovis points were associated with an adult female and a young *Mammuthus columbi* at the base of the second subformation below the surface of the Kersey (T-2) terrace of the South Platte river. Folsom points are also known from the surface of this terrace some distance downstream, another demonstration that Clovis points are geologically older than Folsom.

The terrace sequences along the South Platte in northern Colorado are intimately related to the fluctuations of the alpine glaciations of the Front Range of the Rocky Mountains. As such, they represent, at least in part, the results of deglaciation and the consequent meltwater runoff after the mountain valley terminal moraine "dams" were breached. Therefore, they are most probably associated in some way with general interstadial/interglacial climatic changes, somewhat similar to the interstadial/interglacial assignment of the deposition of the Lewisville terrace deposits, far away to the south.

The fact that the Kersey (T-2) terrace antedates the last major glacial advance, as evidenced by the existence of the Kuner (T-1) terrace below (in turn, most probably associated with the deglaciation that occurred in Recent or Postglacial time) provides yet a stronger, generalized, correspondence with Lewisville.

As to comparison with the dates from Lewisville, Dent offers nothing other than the fact that, here, Clovis points are of an undetermined age older than Folsom, known elsewhere to be about 10,000 B.P. However, since the Kersey terrace Folsom finds are surface occurrences, and there is no geologic evidence that the terrace was flooded or covered by any deposit since its original formation, the Folsom occupation might have occurred at any time from the original deposition of the terrace, up until about 10,000 years ago. Almost any reasonable estimate of the Clovis period is, therefore, compatable with the situation at Dent.

The association with *Mammuthus columbi* is nondefinitive, although certainly agreeable with Lewisville. No positive association of Folsom with *Mammuthus* is yet proved, though one or 2 instances may suggest this.

2. *Blackwater Draw.* Today, this region is a desert of drifting sand; yet beneath this arid surface lies a copious supply of shallow groundwater. Even at this moment, the dragline operator of the gravel pit floats his equipment on a barge, riding the "lake" now filling the extensive, modern excavation. The existing surface sands are the product of Recent aeolian accumulation, accompanied by a lowering of the water table to present level. Prior to this, from about 11,000 years ago up to about 6000 years ago, a rather typical "lake" sequence occurred at the site. This was quite comparable, apparently, to the many "sinks" on the High Plains in moist times. Dating is based on radiocarbon samples from both Blackwater Draw and the closely correlated, similar strata at Lubbock.

From the evidence, a relatively permanent body of water existed at least 10,000 years ago,

exemplified by the blue clay and "diatomaceous earth." At this time Folsom man was present along with a form of bison now extinct, and the moist pluvial climate responsible for the lake is confidently equated with the last major glacial advance in North America. A period of drying up ensued progressively until about 6000 years ago, during which the lake became more and more ephemeral. Seemingly, it then held standing water only after rains, gradually evaporating to expose the floor, which, being far more moist than the surrounding region, would still support a lush vegetation until the next rains produced another temporary lake. This process can be seen in operation today in the High Plains sinks, and yields a cienega type of deposit. The "carbonaceous earth" stratum at Lubbock, following the blue clay of the permanent lake period, demonstrates the sequence even more graphically than that at Blackwater Draw. At both Lubbock and Blackwater Draw this was the time of occupation by people of the general "Yuma" tradition — Portales complex at Blackwater, Plainview at Lubbock.

Important to our discussion is the fact that the above-described sequence correlates in its earliest period, around 10,000 years ago, with the last major glacial advance.

Prior to this last major glacial advance, another depositional sequence occurred at Blackwater Draw, separated from the Folsom pluvial lake above by an arid hiatus of unknown length, which allowed aeolian erosion to produce an important disconformity. If pluvial climates on the High Plains correlate with glacial advances, periods of aridity must, conversely, approximately match the glacial retreats. And in the earlier deposits beneath the disconformity, Clovis projectile points occur in company with a fauna very similar to that at Lewisville. Considering the arid period of aeolian erosion above the Clovis stratum, one is reminded of the increasing aridity above the Lewisville site strata. Here, the evidence of caliche formation markedly increases in the higher layers of the Upper Shuler subformation. As rare, geologically, as caliche formation is this far east off the High Plains, such a major development at Lewisville suggests even drier contemporary conditions as far west as Blackwater Draw. A close, though necessarily generalized, correlation appears in order.

Several other occurrences of early man along the Upper Trinity region reinforce and cross-check with the Lewisville finds:

1. *Lagow Sand Pit.* Ellis W. Shuler of Southern Methodist University recorded the discovery of a highly mineralized, partial, human skeleton at the Lagow Sand Pit in 1920. The location is some 25 miles downstream from Lewisville, and occurred apparently in the identical terrace subformation, with almost precisely identical faunal associations, minus the small forms. As described by Shuler in 1923, the geologic section at Lagow unquestionably matches that at Lewisville; mapped elevations above present stream grade match excellently; and the described section by Shuler, plus the soil still adhering today in the interstices of the Lagow bones, positively identifies the subformation of provenience as the local Upper Shuler, as at Lewisville.

2. *Pemberton Hill.* Downstream on White Rock Creek, and on the opposite side near its confluence with the Trinity River, lies the extensive gravel excavation of Pemberton Hill. Elevations of the terrace remnant almost exactly match those at Lagow. Here the Upper Shuler local subformation is extensively exposed, yielding extinct fauna very comparable to Lagow and Lewisville, plus 2 flint artifacts apparently in situ. These comprise a center section of a broken knife blade and/or spear point, possibly of the Clovis type, a large triangular flint blade, and 3 flint flakes.

3. *Hickory Creek.* Upstream from Lewisville on Hickory Creek, in central Denton County, is a major gravel excavation created for fill dirt for the recent construction of the Santa Fe Railroad connection to Dallas. This is located in an identical extension of the Lewisville T-2 terrace, with major archaeological and paleontological evidence deriving from the same Upper Shuler subformation: two flint flakes, plus some burned bone fragments, along with a fossil, extinct, fauna very comparable to Lewisville, Lagow, and Pemberton Hill.

Conclusions. Based upon geologic, archaeologic, and paleontologic data, with climatic and other inferences therefrom, certain highly plausible, though necessarily tentative, conclusions are possible.

There is little doubt that the Lewisville site was occupied by man in the Late or Upper Pleistocene of North America, certainly prior to the last major glacial advance period. This

type of man was either representative of, or at least contemporary with, the human type that utilized the Clovis projectile point, a relationship which may also apply to Sellards' Llano complex.

Nearby on the Upper Trinity system is evidence of the presence of man in the same geologic stratum, associated with highly similar faunal remains; all things considered, it is unlikely that more than one type of man was present at the same time in such a limited area, at so remote a period in the past.

The period of the Lewisville site occupation must fall into an interstadial or interglacial, prior to the last major glacial advance, based upon evidence of both geology and paleontology. An extensive fauna, closely associated within the site, implies a warm-temperate climate.

Part of this fauna may even reflect winter temperatures somewhat above those of the present, particularly the *Testudo* group, peccary, glyptodon, and snail species now found farther south and southwest. The presence of many extinct types, both mammalian and reptilian, rather definitely places this "warm" period previous to the well-recognized, and relatively late, Postglacial Altithermal.

From geologic analysis it can be determined that the human occupation occurred at a time when the Upper Trinity was at probably an even lower gradient than today, with a broad floodplain, choked with silt, extending nearly 3 miles wide, at an elevation some 70 feet above today's stream grade. This must have materially reduced the present relief between uplands and valleys.

Again drawing on the geology, we can conclude there probably were alternating, and rather violent, wet-dry cycles of climate during the actual site occupation. A series of depositional "layers" occurred, ultimately forming the Upper Shuler subformation, which includes the site. These layers must represent flooding periods of the stream system; yet upon each layer surface, however temporary it may have been, a caliche formation of nodular concretions formed, progressively increasing in size upwards, which testifies to intervening periods of aridity. Both extremes, wet and dry, appear to exceed that known for the region today.

The included faunal remains agree with this apparent paradox. In particular, the "deep woodland" snails present are to be found in more moist regions only to the south and east of the site today. They are supported by other "woodland" indications in both the mammalian and reptilian fauna. On the other hand, the prairie dog is prominent, along with grazing, plains types of mammals, and even in earliest historic times, this harbinger of grassland prairies was found no closer than 100 miles west of the site.

The answer to these seeming contradictions appears to lie in assuming an accentuation of the existing nature of the region today, prairie grasslands on the uplands, with wooded draws and valleys penetrating upstream from the east and southeast. During wetter periods, the wooded draws advanced both upstream and laterally into the valleys; then in dryer periods, the wooded areas retreated downstream and contracted towards the actual stream banks. Fauna, and presumably man, followed these fluctuations. In particular, during dry times, both animals and man may have been remarkably concentrated in the valleys, close to the remaining water and vegetation. Only a 2-legged packrat, such as man, hustling for his existence, may be credited with the unusual occurrence of such diverse remains, concentrated in such a small area, that could not possibly have simultaneously experienced the climatic extremes otherwise indicated.

Archaeologically, the smallness of the hearths, their occurrence upon the surfaces of successive layers of the Upper Shuler subformation, and the paucity of artifacts, suggest sporadic reoccupation of a favored hunting and camping station by small numbers of people, over a long period of time. This is not without precedent, even in early historic times. It is well-recorded that the Caddo of east Texas, and the white man following, were accustomed to coming northwest to the region of Elm Fork in the fall to hunt buffalo; this animal, absent most of the year, descended in numbers from the north, and from the prairies to the west, at this time of year. The large numbers of burned hackberry seeds in the Lewisville hearths attest to such a cycle perhaps as far back as Clovis times, for this seed matures today in the area from August to October.

The great diversity of animal types utilized for food, or more specifically, the lack of concentration upon a certain species, as exemplified in the Lewisville faunal remains and contrasted to other American sites of early man,

reinforces the climatic assumptions. Apparently game was not present in limitless numbers, let alone herds of a given type, so the hunters could not specialize or be "choosey." Meat was meat, as encountered, whether a camel here, a mammoth there, or a rabbit or deer upon the path. Bearing in mind the economy of the present Bushman of South Africa, it is not improbable that the remains of large animals at Lewisville represent only the occasional result of hunting expeditions of the men. There are no indications of a complete carcass, only fragmentary parts such as might be carried in from afar. The multitude of small animal remains might well be attributed to the work of women and children, left in camp, foraging about for sustenance until the men returned from the hunt.

That all this may, or may not, have occurred in North Texas some 37,000-plus years ago, as dated by the radiocarbon method, is intriguing. Of greater significance is the fact that other early occurrences of man are now to be expected upon the G ılf Coastal Plain, in alluvial terrace formations of recognizable geologic provenience, as well as upon the High Plains to the west. The depth of occurrence, as revealed by machinery excavations, is most instructive.

Other Considerations. Many legitimate questions may be raised about this particular find. Answers to a number of the controversial features have already been published in the Early Man section "Notes and News" (AMERICAN ANTIQUITY, Vol. 22, No. 2, 1956); other pertinent details concerning these problems are rather exhaustively explored in the Texas Archeological Society Bulletin of 1957. In any event, the various implications of Lewisville are highly important, regardless of the datings. Despite the fact that these radiocarbon dates are the first from such an early level of American archaeology, the afore-mentioned implications and considerations may well be Lewisville's greatest contribution to science.

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DALLAS ARCHEOLOGICAL SOCIETY
Dallas, Texas
July, 1957

CORRECTION

In "A Peruvian Ikat from Pachacamac" by Ina VanStan (AMERICAN ANTIQUITY, Vol. 23, No. 2, pp. 150-9, October, 1957) the captions of Figures 2 and 4 were exchanged. Figure 2 is a "Diagram of the textile fragments shown in Figure 1," and Figure 4 is "A reconstruction of the ikat design from a single web of the Gravefield I textile."

FLUTED POINTS AND GEOCHRONOLOGY OF THE LAKE MICHIGAN BASIN

GEORGE I. QUIMBY

FLUTED projectile points of chipped flint have been found occasionally in Michigan and Wisconsin. Most, if not all of these, closely resemble the Clovis style of fluted point found in the west. There is some evidence indicating that the western Clovis points belong to a period older than 8000 B.C. A number of archaeologists, myself included, have assumed that the eastern varieties of fluted points are of approximately the same order of antiquity as the western points.

In the upper Great Lakes region it is possible to make a correlation between the distribution of fluted points and glacial events (Griffin 1956) showing that fluted points in general must postdate the maximum of the Cary glaciation. But only in the Lake Michigan basin area is it now possible to make more specific correlations between late Pleistocene surface features and fluted point finds.

Because of lack of geological data and differences of interpretation of the same data by well qualified geologists, there is no single geochronology of pre-Lake Algonquin stage events that can now be applied accurately to the entire upper Great Lakes area. The situation is even worse with regard to correlations between the upper and lower Great Lakes. Only in the Lake Michigan basin is there a reasonably well-established geochronology of geological events that can be combined with a reasonable number of radiocarbon dates.

It is my purpose here to attempt a correlation between certain loci of fluted point finds and specific surface features stratigraphically fixed in the geochronology of the Lake Michigan basin.

Since this approach depends upon the distribution of late Pleistocene surface formations related to glacial advances and retreats and to specific lake levels it can be applied only to an exceedingly restricted geographic area within the Lake Michigan basin. And this geographic restriction automatically excludes from consideration the vast majority of the fluted blade finds in the upper Great Lakes area.

Despite the large area excluded, I have 6 possibly significant loci, three in northeastern Wisconsin and three in western Michigan.

For purposes of this study I have assumed that the fluted points were deposited by paleo-Indians. It is immaterial that subsequently they may have been moved by wind or water so long as the movement was local. I have further assumed that the geochronology and radiocarbon dates used are essentially correct.

Geochronology of Lake Michigan Basin. A brief outline of late glacial and postglacial events in the Lake Michigan basin is as follows:

The Cary glaciation includes all morainic systems in the Lake Michigan basin from the Minooka moraine (earliest Cary) to the Port Huron moraine (latest Cary). In late Cary times, first the Lake Border morainic system and later the Port Huron moraine (Fig. 2) were correlatives of the Glenwood stage of Lake Chicago, a glacial lake with a water plane 640 feet above present sea level (Zumberge 1956: 3-4). In the vicinity of Whitehall, Michigan, the Glenwood Lake plain disappears under the later Valders deposits, presumably ending in contact with Port Huron deposits that also are overlain by Valders drift.

Some radiocarbon dates of different Glenwood deposits are (W-140) 10,695 B.C. and (W-161) 10,245 B.C. (Rubin and Suess 1955: 483). One radiocarbon date (Y-147X) 9985 B.C. probably dates an oscillation in the retreat of the Port Huron moraine in northeastern Wisconsin. This date is from a log "transported by the ice that deposited gray till" (Preston, Person, and Deevey 1955: 958). The gray till in this area is Port Huron till.

Some time after about 10,000 B.C. the Port Huron ice front retreated to a position north of the Straits of Mackinac and the water plane in the Lake Michigan basin dropped to 580 feet above present sea level and perhaps some hundreds of feet lower, depending on availability of eastern outlets. This is the Bowmanville low water stage (Fig. 3) named by Baker (1920: 69) for a type locality in north Chicago. However, in the absence of radiocarbon dates, it is possible that some low water stage other than Bowmanville is indicated by some deposits in the Bowmanville locality. In any case the termination of the Bowmanville low water

stage is clearly manifested at Two Creeks, Wisconsin, where rising waters flooded a forest shortly before it was overridden by the Valders ice front. The much-dated Two Creeks forest bed has a date of about 9200 B.C.

The advancing Valders ice (Fig. 4) dammed the northern outlets of the Lake Michigan basin causing a rise in water to 620 feet above present sea level. This event took place probably about 9000 B.C. (M-288A and W-167, Zumberge and Potzger 1956, Fig. 3).

The Valders drift is spread thinly on top of Port Huron deposits in Wisconsin and Michigan (Thwaites 1943: 136-9; Melhorn 1956: 13-19). The Valders ice did not last long (Thwaites 1943: 137) and did not produce many constructional features. But in the Lake Michigan basin it pushed south of the Port Huron ice position. In Michigan the Whitehall moraine is built entirely of Valders red till (Bretz 1951: 421, 424; Melhorn: 1956: 14) and covers the Glenwood beach levels in the vicinity.

That the Calumet stage of Lake Chicago is a correlative of the Valders ice advance is demonstrated by the elevations of radiocarbon-dated waterlaid sands at South Haven, Michigan (Zumberge and Potzger 1956: 275), and a weak Calumet shore line on the Valders till between Racine and Sheboygan in Wisconsin (Bretz 1951: 418, 420). The Calumet level at South Haven was not attained until after about 9000 B.C. (Zumberge and Potzger 1956: 277) and probably was of short duration. A radiocarbon date (C-630) of about 8725 B.C. (Libby 1952: 678) from driftwood buried in the sediments of Later Lake Oshkosh implies that Valders ice was still present here at this date, and if Valders ice still covered northern Michigan at the same time, then the Calumet stage could have lasted to at least 8700 B.C. (Fig. 5).

The Calumet stage was followed by the Toleston stage in which the water level in the Lake Michigan Basin dropped to about 600 feet above sea level (Bretz 1951: 427) and to 580 feet, if Zumberge's "pre-Algonquin beach" in northern Michigan is Toleston (Spurr and Zumberge 1956: 100). Presumably by the end of Toleston times the ice border had retreated to a point north of the Straits of Mackinac. Although this event is not directly dated it must have occurred after 8700 B.C., since a date

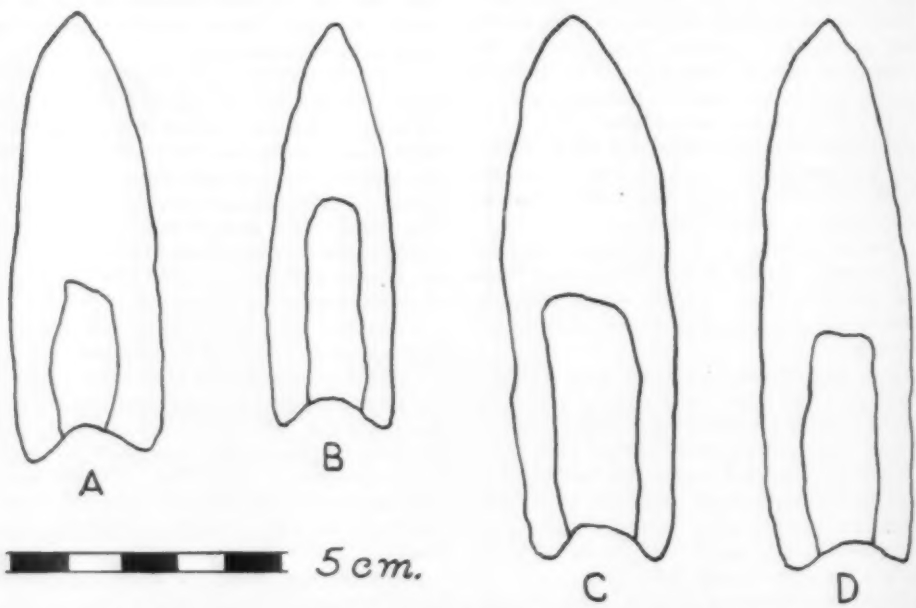

FIG. 1. Outlines of fluted points from the Lake Michigan basin. *A*, Ottawa County, Michigan; *B*, Newaygo County, Michigan; *C*, Waupaca County, Wisconsin; *D*, Winnebago County, Wisconsin.

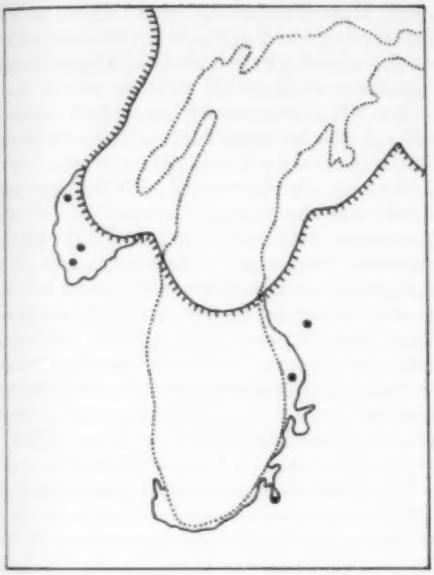

FIG. 2. Lake Michigan basin at time of Port Huron ice and Glenwood stage of Lake Chicago, about 10,000 B.C. Dots indicate loci of point finds; hatchured line is ice; solid line is beach; and dotted line is modern lake.

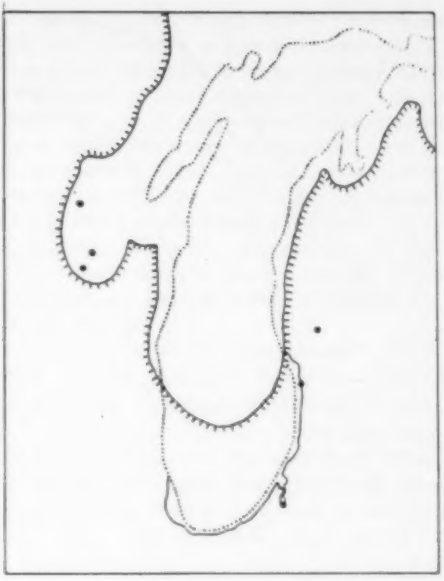

FIG. 4. Lake Michigan at time of Valders advance, about 9000 B.C. Dots indicate loci of point finds; hatchured line is ice; and solid line is beach of Calumet stage.

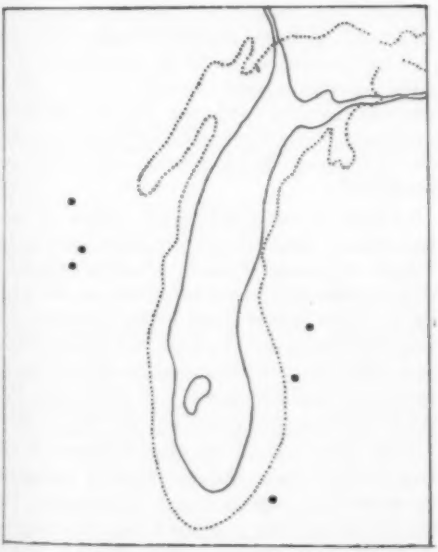

FIG. 3. Lake Michigan basin at time of Bowmanville stage and Two Creeks Interstadial, about 9500 B.C. Dots indicate loci of point finds, solid line is probable beach location.

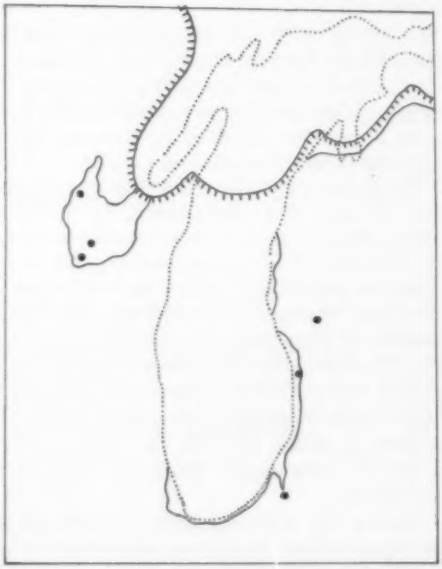

FIG. 5. Lake Michigan basin at time of Valders ice and late Calumet stage of Lake Chicago, about 8700 B.C. Dots indicate loci of point finds; hatchured line is ice; solid line is beach of Calumet stage.

FIG. 6. Lake Michigan basin at time of Glacial Lake Algonquin, about 8000 B.C. Dots indicate loci of point finds; hatchured line is ice; solid line is Algonquin shore where different from Lake Michigan.

(M-359) of 8265 B.C. (Crane 1956: 669) for glacial Lake Duluth implies that by this time the Valders retreat was sufficient to open the Straits of Mackinac, a prerequisite of the Toleston, if properly identified in northern Michigan, and of all subsequent lake stages.

The Lake Algonquin stage (Fig. 6) following the Toleston was characterized by a rise in water plane to 605 feet above present sea level; the Valders ice front still blocked parts of the Superior and Huron basins but was clear of the Lake Michigan basin (Hough 1953: 60-6; Stanley in Greenman and Stanley 1943: 521-8). The Lake Algonquin stage probably began shortly before 8000 B.C. since there are a number of post-Algonquin radiocarbon dates, the earliest of which (W-345) is 7175 B.C. (Lee 1956: 79), suggesting a closing date of the order of 7500 B.C.

During the post-Algonquin transition stage the water plane dropped to successively lower levels: Wyebridge at 515 feet, Penetang at 475 feet, Cedar Point at 455 feet, Payette at 415 feet (Greenman and Stanley 1943: 521-8), and probably to at least 300 feet above present sea level. The Valders ice was present in the Superior basin and at the North Bay outlet during this period which is assumed to have lasted from about 7500 to 6500 B.C.

The Chippewa-Stanley stage had a water plane in the Michigan basin of 230 feet above present sea level and was 50 feet or more lower than this in the Huron basin. At the beginning of this stage the Valders ice retreated from the North Bay outlet and by the end of the period the ice was north of Cochrane, Ontario. The inauguration of this stage at about 6500 B.C. can be determined by adding the 2000 varves of Lake Ojibwa-Barlow (Antevs 1928: 154-5) to a radiocarbon date (W-136) for the termination of Lake Ojibwa-Barlow at 4425 B.C. (Rubin and Suess 1955: 485). The termination of this stage is radiocarbon dated (Y-238) at about 3000 B.C. (Preston, Person, and Deevey 1955: 958).

The Nipissing stage, with a water plane of 605 feet above present sea level, was produced by unwarping of the northern parts of the upper Great Lakes basins and the closing of the North Bay Outlet. Some radiocarbon dates of the Nipissing stage are 2925 B.C. (Y-238, Preston, Person, and Deevey 1955: 958), 1705 B.C. (C-504), and 1518 B.C. (C-364, Hough 1953: 90). Some early post-Nipissing radiocarbon dates are 965 B.C. (M-363, Crane 1956: 669) and 667 B.C. (C-608, Hough 1953: 93).

This brief outline of the geochronology of the Lake Michigan basin is presented in tabular form in Table 1; with the aid of this outline one may make some observations concerning the following fluted points and their proveniences.

Ottawa County, Michigan. Some 18 years ago Henry Yaggie, the late husband of Mrs. Ida Yaggie of Grand Haven, Michigan, found a fluted point on a small sandblow on the north bank of the Pigeon River in the center of Section 3, Olive Township, Ottawa County, Michigan. The locus of the find at elevations between 610 and 620 feet (U. S. G. S. map, Holland Quadrangle) is on an old lake bottom.

The point owned by Mrs. Yaggie is 8 cm. long, 3 cm. wide, chipped from a variegated brownish flint with dark and light streaks. The fluting on one side is about 4 cm. long, that on the other side 2.7 cm. Both flutings end at hinge fractures. The lower one-third of each edge and the concave base have been smoothed.

The provenience of this fluted point can be

related to the geochronological outline in the following way: First, the locus of the find would have been under ice or water during the Cary glaciation, thus the point was definitely deposited after 10,000 B.C. During the Bowmanville stage, an interval some time between 10,000 B.C. and 9000 B.C. the locus could have been available for occupancy by paleo-Indians. During the Calumet stage from about 9000 to perhaps 8500 B.C., the locus first would have been under water in a shallow bay and later in the same period in a swampy shore area. In the early part of this period the Valders ice front was certainly no farther away than 25 miles and may have been much closer. It is unlikely that the area of the find would have been occupied in the early Calumet stage, but it could have been in late Calumet times and later, say after 8700 B.C.

If the point had been deposited prior to Calumet times it seems reasonable to expect evidence of wear from the action of waves and sand on a shallow lake bottom. There is no such wear on the point and it is assumed to have been deposited after 8700 B.C. Such an assumption implies that the point was used and lost in a swampy area near the shore of retreating Lake Calumet.

Newaygo County, Michigan. In 1937 an amateur archaeologist, Percy Mann of Grant, Michigan, showed me a Clovis type fluted point he had found on the windblown surface of a sandy plain in Newaygo County somewhere north of the Muskegon River. He informed me at the time that another fluted point had been found in the same area by another person. Thus, at least 2 fluted points have come from the sand plains of Newaygo County north of the Muskegon River.

Although the exact provenience of these points is not known to me, it is possible to deal with them in general terms in relation to a broader region.

All of the sand plains in Newaygo County north of the Muskegon River are outwash plains or glacial channels (Martin 1955). Moreover, all of these outwash plains and glacial channels are related to the Lake Border system of moraines at a stage just prior to the establishment of the Port Huron moraine (see Bretz 1951: 426). The radiocarbon date (M-350) of a Cary event that was earlier than the Lake Border outwash in Newaygo County is 10,645 B.C. (Crane 1956: 669), thus the Lake Border outwash probably dates at about 10,500 B.C.

There could have been no paleo-Indian occupancy of Newaygo County during the deposition of the Lake Border outwash plains. In fact the earliest feasible occupancy of the area

TABLE 1. SUMMARY OF GEOCHRONOLOGY IN THE LAKE MICHIGAN BASIN AREA.

Estimated Dates B.C.	*Late Wisconsin Chronology*	*Lake Stages and Elevations of Water Planes above Present Sea Level*
11,000	LATE CARY	GLENWOOD STAGE. Glacial Lake Chicago 640 feet above sea level.
	Lake Border Moraines	
	Port Huron Moraine	
10,000	Northward retreat	
9000	TWO CREEKS INTERSTADIAL	BOWMANVILLE STAGE. Water plane lower than 580 feet above sea level.
8500	VALDERS ADVANCE	CALUMET STAGE. Glacial Lake Chicago 620 feet above sea level.
8000	VALDERS RETREAT	TOLESTON STAGE. Glacial lake about 580 feet above sea level.
7500	VALDERS RETREAT	ALGONQUIN STAGE. Glacial lake 605 feet above sea level.
	TERMINAL VALDERS	WYEBRIDGE STAGE. 515 feet.
		PENETANG STAGE. 475 feet.
		CEDAR POINT STAGE. 455 feet.
		PAYETTE STAGE. 415 feet.
6500		Lower stages to 300 feet.
3000	POST-GLACIAL	LAKE CHIPPEWA STAGE. Water plane 230 feet above sea level.
1000	POST-GLACIAL	LAKE NIPISSING STAGE. Water plane 605 feet above sea level.

would seem to have been after 10,500 B.C. and probably at 10,000 B.C. or later.

Berrien County, Michigan. Three fragmentary fluted points were found on the surface of the Moccasin Bluff site on the west bank of the St. Joseph River near Buchanan in Berrien County (Anonymous 1949: 250). This site is situated on a level terrace at an elevation of about 640 feet above sea level. Beyond the boundaries of the site the terrace rises to 660 feet above sea level (U. S. G. S. map, Niles Quadrangle). The site, locus of the fluted blade finds, can be related to the geochronology in the following manner.

According to Leverett and Taylor (1915: 226) there was a glacial lake in the lower St. Joseph Valley between the Lake Border and Valparaiso moraines. This lake stood at 660 feet above sea level and is a correlative of the terrace on the St. Joseph River that stands at 660 feet near Berrien Springs. With the retreat of the ice front, this glacial lake, or a part of it, became a bay of Lake Chicago at the Glenwood stage (see Leverett and Taylor 1915: 351; Martin 1955).

A delta deposit a few miles northwest of Sodus (Martin 1955) has a basal elevation of about 600 feet above sea level (U. S. G. S. map, Benton Harbor Quadrangle). This elevation and the position of the delta suggest it was deposited during the Glenwood and Calumet stages of Lake Chicago. The Glenwood stage of Lake Chicago stood at 640 feet above sea level and extended as a bay nearly to Sodus and perhaps beyond; thus it seems probable that the 640 foot terrace about 18 miles upstream from the bay would have been under water at this time and possibly during the Calumet stage at 620 feet. It seems likely that the earliest paleo-Indian occupancy of the Moccasin Bluff site could not have occurred before 10,000 B.C.and it might have occurred after 8500 B.C.

Waupaca County, Wisconsin. Byers (1942: 400, Fig. 2 *b*) described and illustrated a fluted point "said to have come from the Oxbow on the Waupaca River, town[ship] of Royalton, Waupaca County," Wisconsin. This point, formerly owned by S. L. Spengler of Menaska, Wisconsin, is now in the collection of Robert J. Hruska of Marinette, who kindly allowed me to examine the specimen in August of 1956.

The only oxbow on the Waupaca River in Royalton Township is in Section 31 where the northern part of an oxbow, mostly in Weyauwega Township, extends to or across the line into Royalton Township. There are oxbows in the vicinity of the village of Royalton in Sections 1, 4, and 7, but they are on the Little Wolf River. So presumably, the locus of the fluted point find is Section 31 in the southern part of Royalton Township.

Although the exact provenience of this point is not known to me the general area of its occurrence is of extreme interest, and can be related to significant events in the geochronology of the Lake Michigan Basin. The eastern one-half to two-thirds of Waupaca County, including Royalton and its adjacent townships, is inside the limits of the glacial deposits marking the maximum advance of the Valders ice sheet (Thwaites 1943: 10). The town of Royalton, as well as the township in which it is situated, lie well within the limits of the Valders drift, deposited about 9000 B.C. With the retreat of the Valders ice, southeast Waupaca County was covered by the waters of glacial Later Lake Oshkosh radiocarbon dated at about 8700 B.C. (C-630, Libby 1952: 678). According to Thwaites (1943: 139) Later Lake Oshkosh ended when the Valders ice had retreated far enough north to permit eastward drainage through the Niagara escarpment at Sturgeon Bay, Wisconsin. This event must have occurred by the beginning of the Toleston stage here estimated at 8500 B.C.

The evidence, if correct, indicates that the Waupaca County fluted point could not have been culturally deposited before 9000 B.C. and probably was deposited after 8500 B.C.

Winnebago County, Wisconsin. Two fluted points from Winnebago County have been brought to my attention by Jack Steinbring who supplied the following information. A fluted point in the collection of the Oshkosh Public Museum was found at Lake Butte des Morts in 1920 by Charles Koehn. This point, made of reddish brown quartzite, is 9.8 cm. long and 2.8 cm. wide. The fluting on one side is 3.5 cm. long and 1.7 cm. long on the other. The lower one-third of each edge and the concave base have been ground.

The locus of this fluted point find can be related to the geochronology. All of Winnebago County was covered by the Valders ice (Thwaites 1943: 10, Fig. 20). With the retreat

of the Valders ice all of Winnebago County, except possibly some small isolated islands, was covered by the waters of Later Lake Oshkosh (Thwaites 1943: 10, Fig. 21). Consequently the area around modern Lake Butte des Morts would not have been available for paleo-Indian occupancy until about 8500 B.C. and the fluted point found there must date after this time.

Another fluted point from Winnebago County was collected in 1956 by Jack Steinbring from a prepottery site on the east side of Rush Lake. This point, about 4.4 cm. long and 2 cm. wide, is fluted on one side only with a channel about 1.7 cm. long. The locus of this find seems to be within the limits of the Valders ice (Thwaites 1943: 10, Fig. 20) and therefore was not available for human occupancy until after 9000 B.C. Moreover, this locus may have been within the limits of Later Lake Oshkosh in which case it would not have been free of water until after about 8500 B.C.

Summary and Discussion. Six fluted point proveniences in the Lake Michigan basin seem to be related significantly to surface formations that are post-Late Cary in time. These relationships suggest that none of these particular finds is older than 10,000 B.C and some are not older than about 8500 B.C.

It is, of course, possible that in some middle-western areas outside of the Lake Michigan basin fluted points will be found to be older than those considered here. A study of more than 100 fluted points now being undertaken at the University of Michigan by Ronald J. Mason will help to solve this problem.

Although the evidence presented shows that some fluted points in the Lake Michigan basin were not earlier than 8500 B.C. it does not indicate how much later than 8500 B.C. they might be. A useful hint on this matter comes from James B. Griffin (1956) who writes, "In certain finds in Michigan, the location of fluted blades is . . . on the landward side of the Algonquin shore line. . . ." In other words, in areas of eastern Michigan where there exists a considerable expanse of land that once was covered by Lake Algonquin, fluted points have not been found. This could mean that fluted points were not used by paleo-Indians after the termination of the Lake Algonquin stage about 7500 B.C.

It is tentatively concluded that the fluted points in the Lake Michigan basin were deposited there some time between 10,000 B.C. and 7500 B.C. This is the period during which spruce and fir dominated the forests of the region (Zumberge and Potzger 1956). It is also the period approximating the range of radiocarbon dates for mastodon remains found in Michigan and adjacent areas (Crane 1956: 666-8; Griffin). Thus there was perhaps an association of spruce-fir forest, mastodons, and fluted points in the Lake Michigan basin area from about 10,000 to 7500 B.C.

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AN EARLY COMPLEX IN SAN DIEGO COUNTY, CALIFORNIA

D. L. True

THE ARCHAEOLOGY of the San Luis Rey Basin is characterized by a series of sites which for the most part conform to the San Luis Rey complexes described by Meighan (1954). San Luis Rey I is characterized by dark, sooty midden deposits containing small pressure flaked projectile points, manos, portable metates, spire-lopped and disc beads of *Olivella*, drilled stone ornaments, and portable and bedrock mortars with unshaped cobble pestles. San Luis Rey II contains all of the above elements plus pottery, pictographs, and historical artifacts on the terminal sites. The physical locations for San Luis Rey sites seldom deviate from streamside locations in close proximity to boulder outcroppings suitable for bedrock mortars and shelter. In addition to the San Luis Rey sites there exists, scattered throughout the northeastern part of San Diego County, a series of sites which apparently do not belong with the San Luis Rey complexes. The probable existence of a "pre-Luiseño" complex in this area was suggested by Eberhart (1952) and Meighan (1954: 222). That certain sites did not conform to the known local pattern was apparent as early as 1946 when present survey efforts were initiated.* These sites, which because of their distinctiveness must be older than either San Luis Rey I or II, form the basis of this report. The sample of both sites and artifacts is small; the pattern however, appears to be consistent and definitive. A total of 25 sites has been discovered. These are characterized by crude chipped stone implements and grinding tools which reveal similarities to the San Dieguito complex (M. J. Rogers 1929), as well as to Topanga, Oak Grove, and other early remains from areas to the north. In addition to their general typological crudity, the artifacts and some of the sites are associated with geological features indicative of some antiquity.

To simplify future reference to this complex it is suggested that it be termed "Pauma complex" after the valley in which the type site is located.

Geological and Geographic Background. Located about 30 miles northeast of the modern town of Oceanside, this area falls within the California Peninsular Range province. Semiarid in climate, the region is subject to infrequent, but sometimes heavy, flooding and erosion. The nature of the terrain and climatic conditions in force since Pleistocene times have combined to produce alluviation on a considerable scale. This erosion and mass wasting process appear to have substantially altered many physical features of the area. However, remnants are present of rather stable geological features, originating in Pleistocene or early Recent times, that have seemingly retained much of their original structure and appearance. Because many of the sites of this series are found on these or similar features, some explanation of the Quaternary geology of the area seems necessary.

Pleistocene and Recent geological activity in the area has been confined primarily to landslide activities, faulting, alluvial depositions, and related erosive functions of the San Luis Rey River and its tributaries.

In the Pauma Valley proper at an elevation between 700 and 800 feet is a bluff or terrace composed of alluvium and river debris, some of which appears to be material similar to the Agua Tibia mudflow deposits partially overlain by mantles of more recent soils. At an elevation of approximately 1200 to 1600 feet above sea level a series of benches comprise well-defined features along the northern perimeter of the valley. Here mudflow remnants appear to be intermixed with landslide materials and other transported deposits. The benches seem to be very complex in their structures and origins, and for the most part appear to be the result of direct and indirect influences of the Elsinore fault zone which bisects the area. While some of the benches are no doubt the result of direct faulting, the majority are more than likely landslide materials or large chaotic accumulations of broken rock derived from the fault zone by gravity movements (Richard Jahns, personal communication, 1954). At

* Appreciation is expressed to C. W. Meighan, University of California at Los Angeles. His generous contributions in time and many helpful suggestions have made this report possible. Richard Jahns, Department of Geological Sciences, California Institute of Technology, contributed background as well as detailed geological data on this area.

thermal occupation, locally, would probably be few in number. Thus even with the onset of the more favorable Medithermal period a population increase would probably be slow and closely tied to the recovery of the permanent vegetation. Such reduced or nonexistent activity could easily be responsible for the apparent dearth of occupation through a portion of both the Altithermal and Medithermal periods. There is no apparent evidence of occupation following the Pauma complex until population influxes or influences from other areas probably introduced the artifact assemblages typical of early San Luis Rey I.

Lithic Resources. Local resources were used in most ground stone artifacts, while chipped materials were nearly all imported. Granites and several metamorphics are readily available as float, as well as from outcrop sources. Pegmatite dikes provide plentiful quantities of quartz, although quartz is not especially common in the artifact sample. Basalt is not found locally, but is common in the Murietta area some 20 miles north and east of Pala. Felsite is reportedly found in the gorge of the San Dieguito River southwest of Escondido (M. J. Rogers 1929: 461). Old alluvial beds found in the coastal strip and generally throughout the southwestern part of the county contain cobbles of basalt, basalt porphyry, and other fine-grained volcanics (Poway Conglomerate). Travel to the coast or trade with the inhabitants of the area could make this material available locally. It appears that at least some of the artifacts found here are of this origin. Artifacts of chert, jasper, and chalcedony occur but are not common; the material is not indigenous to this area and its origin is unknown. It is assumed however, that this material was imported from the desert areas to the east. Obsidian is found at the southern tip of the Salton Sea, but seems to be rare on sites in this complex with only one small fragment recovered to date.

Rincon 47. Of the sites presently assigned to this complex, Rincon 47 is the richest in terms of artifact yield. The site is located on what appears to be a fairly old river terrace or mudflow remnant overlooking the present San Luis Rey River channel. Present stream locations are close to ½ mile from the site. Unfortunately, the area has been farmed for at least 40 years and has undergone several land clearing and rock removal operations. The owner states that in the early days he consistently plowed up metates and manos, using a horse-drawn moldboard plow. Present farming methods using a disc harrow have cut down the frequently of the finds. As recently as 1946 however, the appearance of manos was common following cultivation and rain. For the past 4 years most of the site has been planted to permanent pasture and has not been worked. The site area is scattered over at least 10 acres. The elevation is close to 800 feet above sea level at the top of the bluff, and about 30 feet above the present river bed. Careful examination shows no sign of soil alteration. Hearths, house pits, bone, and shell remains are not found.

Metates from this site are primarily deep basin forms with only one slab or shallow basin known. All show evidence of pecking on basin wear surfaces. Granite is favored material and most specimens are either fragmentary or show cracks and fissures in several stages of development. Wear surfaces or shoulders as described by Mohr (1954: 394) and Treganza and Malamud (1950: 141) are noted on 3 specimens, but these are not pronounced. The deeper basins have unbroken wear surfaces on all sides. The basins are quite symmetrical in outline, elevation, and section. Off-center basins described by Treganza and Malamud (1950: 141) are not apparent in this sample. Average size of the grinding surfaces is 22 by 29 cm. with depressions ranging from 0.6 to 8.0 cm. deep. Slabs are usually rough ovals although in many cases original shapes are unknown. A total of 16 whole and fragmentary metates have been recovered from this site; one shallow basin or slab type, 2 medium basin, and 4 deep basin types, with 9 fragments, all of which appear to have been deep basin types. One specimen is double sided with grinding depressions on both slab surfaces. One medium basin and 2 deep basin types show evidence of wear shoulders and 2 appear to have been killed, with plugs broken from the centers of the grinding surface.

A total of 39 manos has been found. In addition many more are known to have been removed by private collectors in the past. Manos range from slightly used monofacial cobbles to well worn bifacial types; pecking is common on nearly all wear surfaces. Sizes range from 9.7 by 7.1 by 5.8 cm. to 16.2 by 8.0 by 5.9 cm., and the average size is 11.6 by 8.6 by 5.5 cm. Granites predominate in the sample, although occasional schist and gneiss specimens are found. Of the 39 manos, 11 are monofacial unshaped cobbles, 5 are shaped monofacial cobbles, 4 are unshaped bifacial types, and 11 are shaped bifacial types. One monofacial type has grinding on one edge and 5 bifacial types have indications of edge grinding. Two out of the total are pitted on one wear surface, and 8 show evidence of end battering indicating usage as hammerstones as well as manos.

A total of 17 unshaped cobbles has been found, with battered ends or edges. Of these 5 appear to have slight wear surfaces on one side. Of the five, 3 have pitting on the wear surface.

Two small cobbles with slight wear surfaces are assumed to be rubbing stones of some sort.

Four semiround stones or "balls" have been found. Apparently shaped by pecking, all are slightly flattened on at least one side. On 3 specimens slight wear surfaces are noted. Sizes range from 8.4 by 10.0 cm. to 10.0 by 12.6 cm. Stone balls are reported from several coastal sites in California. Treganza describes 4 found at the Tank site (Treganza and Malamud 1950: 150). Two somewhat larger specimens were found at San Fernando by Walker (1951: 23). Similar large spherical stone objects are reported from a cairn site near Saticoy, Ventura County, California (Meighan, personal communication, 1955). All are believed to belong to occupations of at least 2000 years ago.

A single granite disc 11.1 cm. in diameter and 3.7 cm. thick was found. Both surfaces have been smoothed, with light pecking on both sides. The edges are slightly beveled and the surfaces are nearly parallel. The disc varies less than 2 mm. from a perfect circle. Similar artifacts are described from several of the older complexes in California. The Tank site in Topanga Canyon,

TABLE 1. ARTIFACT DISTRIBUTION BY SITE IN THE PAUMA AREA OF SAN DIEGO COUNTY.

All site numbers are preceded by *Rincon*.

	METATES	MANOS	COBBLE HAMMERS	CORE HAMMERS	CORE SCRAPERS	DISCOIDALS	STONE BALLS	CRESCENT STONES	PROJECTILES OR BLADES	CHIPPING WASTE
20	4	29	–	–	2	–	–	–	2	10
20A	2	12	1	–	–	–	–	–	–	41
20B	5	26	3	–	2	–	–	–	–	41
47	16	39	17	–	8	1	4	–	2	36
71	5	23	2	2	2	1	–	–	–	6
41A	6	14	2	1	5	–	–	–	6	108
43A	–	7	–	–	–	–	–	–	1	7
130	2	4	–	–	–	–	–	–	–	–
135	–	5	1	1	2	–	–	–	1	76
100	3	6	–	–	3	–	1	–	–	18
132	–	–	–	–	–	–	–	–	4	55
137	–	9	1	–	3	–	–	–	–	40
95	–	–	–	–	–	–	–	–	3	123

TABLE 2. ARTIFACT DISTRIBUTION BY SITE IN THE VALLEY CENTER AREA.

All site numbers are preceded by *Valley Center*.

	METATES	MANOS	COBBLE HAMMERS	CORE HAMMERS	CORE SCRAPERS	DISCOIDALS	BALLS	CRESCENT STONES	PROJECTILES OR BLADES	CHIPPING WASTE
22	1	13	1	–	–	–	–	1	–	19
26	2	16	3	–	2	–	–	–	2	63
33	–	4	–	–	9	–	–	–	–	62
37	–	3	2	–	–	–	–	–	–	–
27	–	5	4	–	4	–	–	–	–	–
39	1	5	–	–	–	–	–	–	–	9
21	3	8	–	1	3	–	–	1	–	3
28	2	10	4	3	3	–	–	1	–	32
31	4	17	2	2	9	–	–	–	2	65
12A	6	22	6	–	15	–	–	–	3	50
23	–	2	–	–	–	–	–	–	1	22
46	–	4	1	–	11	–	–	–	6	355

Los Angeles County, Walker's metate site in San Fernando (Walker 1951: 25), the second level of the Malaga Cove site (Walker 1951: 55), and Little Sycamore Creek in Ventura County (Wallace and Wallace 1954: 114) all include discoidal ground stone objects in the artifact samples. All of the above occurrences are in sites believed to be over 3000 years in age.

Other ground stone objects include a small perforated disc described by its owner as a little doughnut. This object was about 1½ inches in diameter. Located many years ago during early land clearing operations, this object has been misplaced by its finder and must be presumed lost. No similar specimens have been found within the complex, but an artifact similar in size and description was found on a San Dieguito site near Escondido.

Scrapers consisting of flakes and cores of basalt and felsite are found that resemble those described by Treganza and Malamud from the Tank site in Los Angeles County as well as many of Rogers' San Dieguito specimens. Sizes range from 2.6 by 3.4 cm. to 5.9 by 5.3 cm. at Rincon 47 and up to 10.3 by 11.0 cm. on all sites in the complex (Fig. 2). Of the 8 artifacts in this group, 7 are basalt and one is felsite. In addition 36 chips and cores believed to represent chipping waste have been recovered. Twenty-five are basalt, 9 are felsite, and 2 are other fine grained volcanics.

Blades are rare, with only 2 fragments found in this site. The fragments are poorly made of quartz and seem to be midsections about 1.2 cm. thick and 2.5 cm. wide for one specimen and 1.0 cm. thick and 2.1 cm. wide for the other.

Surface collecting has produced a total of 94 artifacts from this site. Eighty are ground stone, 14 are chipped, and an additional 36 fragments are chipping waste.

The predominance of grinding implements over chipped artifacts on this site suggests a seed grinding economy based on manos and metates in contrast to the mortars and pestles which dominate the later San Luis Rey sites. The small pressure flaked projectile points common on the later sites are absent here, as

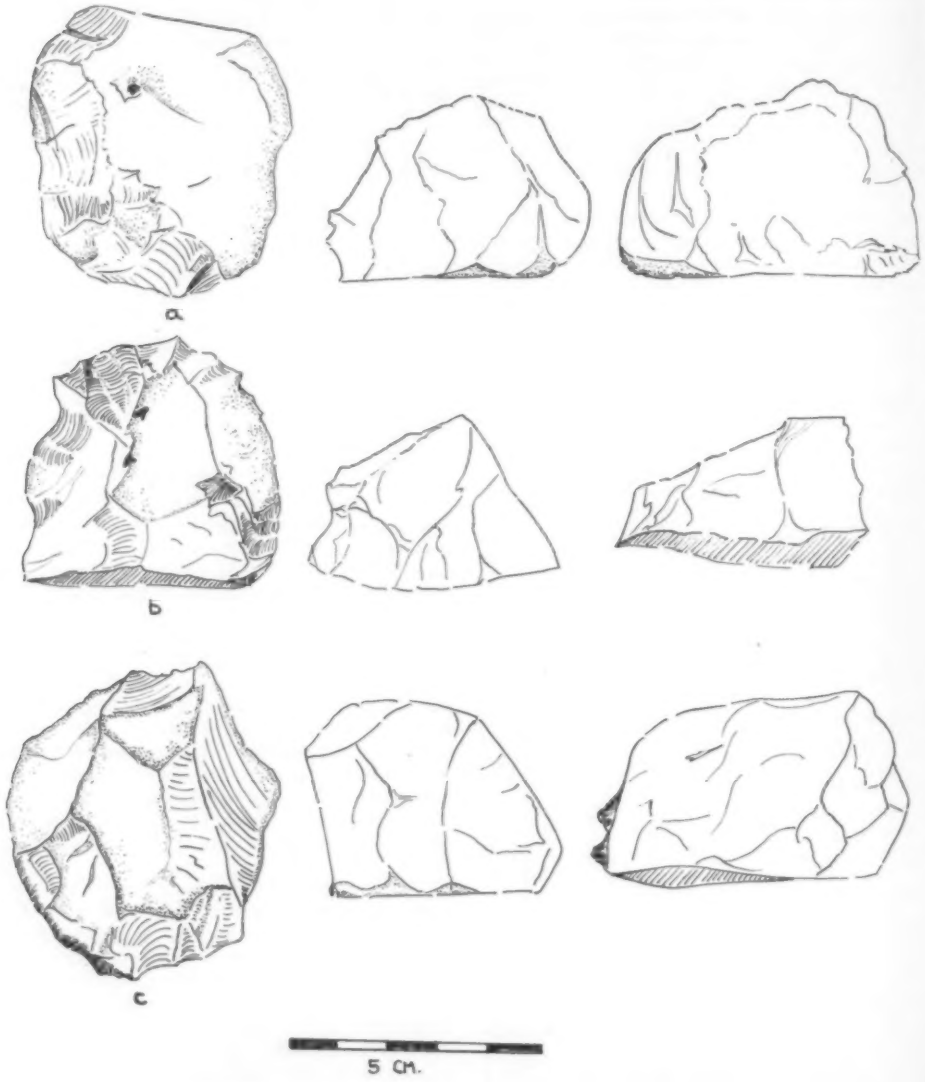

FIG. 2. Planes and core scrapers from Rincon 47 (each shown in 3 views).

FIG. 3. Chipped implements from sites of the Pauma complex.

are artifacts of shell and bone. Lack of shell on a site in an area easily accessible to the sea, and in which later inhabitants made annual migrations to the coast, points either to a variation in cultural pattern or to considerable time during which all such perishable remains have weathered away. Surface indications and apparent lack of deposit depth points to a seasonal camp rather than a permanent village location.

* * *

Other sites in the complex are quite uniform in appearance. In the Pauma-Pala area (Table 1) they are characterized by thinly scattered artifacts located on the mudflow deposits and fault benches. In the Valley Center area (Table 2), they are found on exposed knolls and saddles overlooking present intermittent water courses. All known sites appear to be surface deposits. Midden deposits, house pits, or other dwelling remains are not found. Sites vary in area from 2 to approximately 20 acres, and range in elevation from 480 to 1800 feet above sea level. (Sites of the San Luis Rey complexes range from just above sea level to over 5000 feet on Mount Palomar.) Shell is absent and bone is represented by a tiny handful of unidentified fragments. Chipped artifacts are not common, but several interesting and possibly diagnostic points or blades have been recovered:

1. Stemmed base fragment of gray basalt (Fig. 3 *a*). Site Rincon 41-A.

2. Side-notched, straight-based fragment of quartz (Fig. 3 *b*). Site Rincon 41-A.

3. Concave base triangular point of jasper, complete (Fig. 3 *c*). Site Rincon 43-A.

4. Somewhat triangular basalt point with a slight basal notch and side notches (Fig. 3 *d*). Site Rincon 132.

5. Oval leaf-shaped blade (Fig. 3 *e*). Site Valley Center 23.

6. Crude leaf-shaped blade fragment of quartz, 3.8 cm. wide by 0.9 cm. thick, with an unrestored length of 5.8 cm. Site Valley Center 12-A.

7. Leaf-shaped point of felsite, 1.8 cm. wide by 2.8 cm. long by 0.6 cm. thick. Site Valley Center 46.

8. Triangular point with straight base of felsite, 2.1 cm. wide by 3.6 cm. long by 0.6 cm. thick. Site Valley Center 26.

9. Point base, fragment, of chert, 1.5 cm. wide by 0.5 cm. thick with an unreconstructed length of 1.7 cm. Site Rincon 135.

10. Leaf-shaped point of jasper-agate, 2.1 cm. wide by 3.5 cm. long by 0.7 cm. thick. Site Rincon 95.

11. Crescent stone, complete, of felsite (Fig. 3 *i*). Site Valley Center 21.

12. Crescent stone fragment of chert (Fig. 3 *j*). Valley Center 22.

13. Crescent stone, complete. Valley Center 28.

14. Possible drill fragments Fig. 3 *f*, *g*). Rincon 20 and Rincon 100.

Nearly all sites in the complex seem to fall generally into Wallace's (1955) milling stone Horizon II. However, Wallace (1955: 219-21) has separated the San Dieguito complexes from his Horizon II and places them in Horizon I, early period. For some inland manifestations of San Dieguito, at least (for example, Rogers' Escondido Locus IV), this may create some questions, since nearly all elements described by Wallace as being typical of the milling stone complexes in Horizon II are found on nearly all San Dieguito sites examined by this writer. This is not to suggest that Wallace's dating for San Dieguito is in error, but more to emphasize the milling stone elements apparent in at least some San Dieguito sites.

Similarities between the Pauma complex and elements of San Dieguito are obvious. That this complex represents another locus of the San Dieguito culture or is a peripheral area of Rogers' Escondido locus has been suggested (Meighan, personal communication, 1954). However, no conclusions or even close comparisons can be made until there are more data available from the San Dieguito areas and until the status of San Dieguito has been determined.

No firm conclusions can be drawn from available data, but typological relationships with several of the older Southern California complexes are indicated. Located less than 25 miles from Escondido this complex is within easy reach of M. J. Rogers' Locus IV (1929: 455). The proximity of the central San Luis Rey basin to the whole San Dieguito culture area, including both Escondido and coastal strip foci, plus probable migrations to the coast of the inland inhabitants, indicates probable contacts between these complexes. Strong inclination toward a seed gathering economy with grinding implements dominating the artifact assemblage are suggestive of close relationships with such complexes as Topanga and Oak Grove. Importation of jasper, chert, and agate from the desert areas to the east along with some similarities in artifacts also indicate possible contact with some of the older desert

groups. Contact with such complexes as Lake Mohave or Pinto Basin would not have been impossible and some artifact types in this sample are similar to types found in the desert location (Fig. 3 *a*, *d*).

Comparative analysis of the small artifact sample presently available with those of San Dieguito, Oak Grove, Topanga, Sycamore Creek, and other milling stone complexes in Southern California indicates a sharing of certain elements. This relationship is becoming increasingly evident as data accumulate and it appears to be only a matter of time until these complexes are satisfactorily fitted into the time sequence of California archaeology.

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PAUMA VALLEY, CALIF.
February, 1957

SPLIT-TWIG FIGURINES IN THE GRAND CANYON

DOUGLAS W. SCHWARTZ, ARTHUR L. LANGE, AND RAYMOND DESAUSSURE

THE Grand Canyon in northwestern Arizona has long been a favorite area of study for geologists from all parts of the world, but until recently little intensive archaeological work has been done within the canyon itself. In 1953 the senior author began to investigate Cataract Creek Canyon, the only major drainage leading from the Coconino Plateau on the south to the Colorado River. Also in this year Walter W. Taylor (1954) made a quick survey of the lower reaches of the Grand Canyon by boat, but due to high and fast water he was unable to locate many sites. The present project was the first major excavation to be carried on in the main canyon area and it revealed material that should stimulate further work in the region.

In 1953, 1954, and 1955 Arthur L. Lange and Raymond deSaussure, staff members of the Western Speleological Institute, conducted a survey of the caves in Grand Canyon National Park. In four of the approximately 150 caves located they found split-twig figurines. These finds and their locations were communicated to Malcolm Farmer, then Assistant Director of the Museum of Northern Arizona, who in October of 1954 visited one of the caves with Lange and deSaussure and collected surface material. This joint trip stimulated an article by Farmer and deSaussure (1955) which reviewed the previous figurine material and discussed the new finds. It was also at this time that the senior author was asked to undertake the intensive archaeological investigation of the Grand Canyon figurine caves.

The work of the Grand Canyon Figurine Project was shaped around 3 basic problems. (1) Description: Split-twig figurines had only been found in small numbers; therefore, few data were available for their description or appraisal of their variations. Since the work was to be done in caves in which figurines had been reported in fairly large numbers, it seemed reasonable that enough material could be collected and studied to obtain fairly complete descriptive data. (2) Chronology: As pointed out by Farmer and deSaussure (1955) the dates suggested for the original figurine material in the earlier sources ranged from approximately 10,000 years ago (Gypsum Cave association) to as late as A.D. 1300. Since none of these previous associations was entirely certain it was felt that further work was needed to place the figurines satisfactorily in time. The major reliance for solution of this problem was on stratigraphic testing and radiocarbon dating. It was also hoped that associated artifacts would give some hint of the general time level of the figurines. (3) Cultural affiliations: The range of suggested dates for the figurine material is no wider than the variety of cultures to which they have been assigned. These include Gypsum Cave Hunters, Basketmaker, Pueblo, and Yavapai (Farmer and deSaussure 1955). Therefore, it was hoped that by concentrated work in one group of sites the associations would give some ideas concerning the culture of the split-twig figurine makers, as well as its relationship to other cultures in the Southwest.

Field Work. Field work was undertaken in August, 1955, the nature and amount being limited by the unusual location of the sites in areas difficult to reach by the main Grand Canyon trails. All food, equipment, and water had to be back-packed to the sites and excavation time was somewhat limited as a result of this. Nevertheless, at each site enough work was done to get what was thought to be a representative sample of the material; much original floor was left unexcavated, and caches were left intact in each.

Previous Figurine Finds. To familiarize the reader with previous work the following chronological list is given, with the date of the find, location, persons involved, reference, present disposition, and any general remarks which seem pertinent. The numbers in front of each of these paragraphs refer to the numbers on the general location maps (Figs. 1, 2).

1. 1933 (winter), Clear Creek, Grand Canyon National Park; CCC crew; Wheeler 1949, Farmer and deSaussure 1955; 1 specimen at Grand Canyon Wayside Museum, 2 at Grand Canyon Naturalists' Workshop. This site is believed to be Luka Cave.

2. 1933-34, Clarkdale (Sycamore Canyon), Arizona; Bertha Ullrick; Wheeler 1949, Farmer and deSaussure 1955; 10 specimens at Tuzigoot National Monument, 4 presently unknown as to location, 1 at Arizona State Museum.

FIG. 1. Location map to figurine sites in the Southwest (see key in text).

3. 1934, Vasey's Paradise (probably Stanton's Cave), Grand Canyon National Park; Buzz Hatch, a member of Clyde-Eddy party; Wheeler 1949, Clark Wissler and Hoffman Birney Correspondence, November 20, 1934, in Museum of Northern Arizona files; "a hatful" of specimens, probably 12 to 15; 4 specimens in American Museum of Natural History, 1 kept by each of party. The figurines were found about 60 to 70 feet within the cave, several on the surface, and the majority at a depth of 2 to 4 inches. Pottery association was reported, but subsequent investigation throws doubt on this.

4. 1935, Etna Cave, Lincoln County, Nevada; S. M. Wheeler; Wheeler 1937a, 1937b, 1942; 3 whole figurines, 9 fragments; specimens were divided between Southwest Museum and Overton Museum; at least 3 are at the former location. 5 figurines were reported as associated with Basketmaker III, 4 as associated with Gypsum Cave type material, and 3 as indeterminable.

5. 1939, Vasey's Paradise (Stanton's Cave), Grand Canyon National Park; Russell Frazier; letters from Russell Frazier to Julius F. Stone in the Grand Canyon collection of Otis Marston; 12 good specimens, 20 poor ones, 1 specimen to Southwest Museum, 1 to University of Ohio, and 1 at Capital Reef National Monument. Majority of specimens destroyed by fire.

6. 1951, Moapa Valley shelter, Clark County, Nevada; Bradley Stuart; Schroeder 1953. 1 specimen, present disposition unknown. This was reported as a tule figurine and at the same site from which a grooved sandstone boulder and a unifacial percussion scraper were reported.

7. 1954, Vasey's Paradise (Stanton's Cave), Grand Canyon; reported through University of Utah; 3 whole specimens and 4 fragments, at University of Utah, except for 1 specimen on loan to Museum of Northern Arizona.

8. 1954, Tse-an-Kaetan, Cremation Canyon, Grand Canyon National Park; Farmer, Lange, and deSaussure; Farmer and deSaussure 1955; 23 specimens at Museum of Northern Arizona.

9. 1954, Tse-an-Sha, Pipe Canyon, Grand Canyon National Park; Lange and deSaussure; Farmer and deSaussure 1955; 3 specimens at Museum of Northern Arizona.

10. 1954, White Cave, Cottonwood Canyon, Grand Canyon National Park; Lange and deSaussure; Farmer and deSaussure 1955; 8 specimens at Museum of Northern Arizona.

11. 1956, Newberry Cave, near Barstow, California; Gerald Smith; AP news release to *Los Angeles Times*, February 10, 1956; 7 specimens (?), San Bernardino County Museum. Very little known about these as yet.

[EDITOR'S NOTE: a report has recently been published; see review this issue.]

Environment. The caves which yielded figurines were all located in the Redwall escarpment, the most prominent cliff of the Grand Canyon, formed of a massive crystalline limestone and dolomite of Mississippian age (Fig. 3). Most of the caves which occur in the Redwall are difficult to approach because of the declivity of the cliff face, which commonly

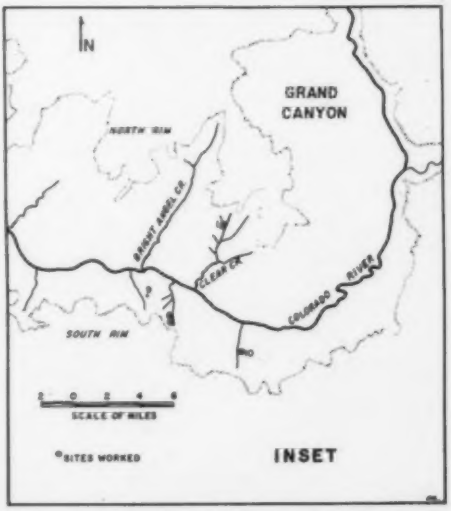

FIG. 2. Location of figurine sites in Grand Canyon.

overhangs. Its height is consistently 500 to 600 feet.

The general elevation of the caves is 4000 to 5000 feet, which is approximately the present-day boundary between the Lower and Upper Sonoran life zones, about 1000 feet below the canyon's south rim. At the cave level the mesquite, cactus, yucca, and agave of the canyon bottom intermingle with the pinyon and juniper of the rim. Water is intermittently available in springs and streams issuing from the base of the limestone, to which the game — deer, bighorn sheep, and rodents — are attracted. During summer rains water is found throughout the canyon wherever potholes collect runoff.

The caves are the result of limestone solution along joints and bedding planes, subsequent enlargement having taken place by rockfall. The figurine caves range in size from small caverns 60 feet in horizontal depth to cave systems containing several hundred feet of passages, with totally dark interior chambers. Dust, soil, dung, fallen roof-slabs, flowstone, and country rock comprise their floors. Speleothems, such as stalactites, draperies, and crystals, decorate the interiors of certain caves; in others, these secondary deposits are lacking, or have been eroded away.

FIG. 3. View of N.A. 5686 (Figurine Site 8) from below.

The location of the 3 figurine caves excavated and the one other surveyed during the summer of 1955 are given on Figure 2 with the following numbers:

1. Luka Cave
8. Tse-an-Kaetan
9. Tse-an-Sha (not excavated)
10. White Cave

Description of the Caves. The surfaces of the 3 cave floors examined were fairly similar, all being dry, dusty, and unconsolidated as well as smooth and level where not obstructed by large rocks. Floors were usually composed of dust, dung (probably rodent of some kind — rat or ground squirrel), organic material (mostly small, but some large pieces of mescal, grass, and other plants), and large and small rocks, usually natural limestone chips and spalls. All of the caves also contained large numbers of relatively short split twigs which either are remnants of the raw material used in the construction of the figurines or were brought in for some other purpose. Some areas were found with consolidated manure, which appeared to be from larger animals. Some ash and small bits of charcoal were located just below the surface, but no burned material was found on the surface. In Tse-an-Kaetan (N.A. 5686), near the back of the first chamber, there were several depressions about 1 foot in diameter and 6 inches deep. These proved to be natural. A significant number of figurines and figurine fragments was also found on the surface of the cave floor.

Stratigraphy. The stratigraphic work in the figurine caves gave only negative results, for nothing of cultural significance was uncovered. Except for about 6 figurines which were randomly scattered near the surface, and one chipped stone piece found at a depth of about 6½ inches at Tse-an-Kaetan, no artifacts or signs of occupation of a recognizable kind were found below the surface in the caves.

The cave floor deposit was much the same at all three of the sites. The top 8 inches was very similar to the surface composition, unconsolidated and composed of small rocks, dust, rodent droppings, small bones of bat and

rodent, and miscellaneous vegetable material. Some small, unconsolidated areas of ash and charcoal were found, mainly in the top 4 inches. All the figurines found during the stratigraphic testing were in this upper level, primarily in the upper 4 inches.

Below the 8-inch level the deposit was generally very consolidated, gradually decreasing in the amount of manure while increasing in the amount of dirt and rock. Below this 8-inch level no artifacts at all were found. Most of the digging was concluded at about 13 inches because of the presence of large pieces of fallen ceiling rock.

At Tse-an-Kaetan a trench was dug under Surface Feature 1 in order to collect pollen samples. At about 24 inches the dung had completely disappeared and for the next 7 inches there was a reddish soil with angular chert and limestone fragments. This trench was also stopped because of a large rockfall. Roger Anderson's pollen analysis (personal communication, January 3, 1956) is presented in Table 1.

Caches. Although a few figurines were found on the surface of the cave sites the majority came from cache pits slightly below the surface. The caches appeared to be of 2 types, one which can best be termed a pit and one which resembled a rat's nest. If it were not for the great number of specimens in the second type there would be some doubt in the author's minds that they were man-made.

For the most part both types of figurine caches were located near the side of the cave rather than near the center (Fig. 4). Except for 2 cases they were all situated at the junction of the floor and the vertical cave wall.

Five of the pit type figurine caches were examined, all at Tse-an-Kaetan. All were covered on the surface with fairly large rocks, ranging in size from about 8 by 16 inches to 13 by 21 inches and a few smaller. Most of these were laid flat over the cache, but in one case 2 rocks were tilted up to form a shelter over the cache. Usually with the removal of the rock cap at least one and sometimes up to 5 figurines were visible. Parts of them were frequently covered with dust, but nearly always their presence could be detected. Also in 4 out of 5 cases large amounts of either shredded juniper bark or bundles of grass were found covering all or part of some of the specimens. With the removal of the top figurines, bark, and grass, more figurines were revealed. These were invariably partially covered with dirt, and in some cases, not visible at all, and were only located after carefully excavating (sweeping dust away with a paint brush) more of the cache. The depth of these pits was usually

TABLE 1. POLLEN ANALYSIS.

Sample	*Depth in inches*	*Pollen*	*Percentages (approx.)*
1	Surface	Juniperus-Cupressus (juniper, cypress)	40
		Gramineae (grass)	10
		Compositae (flowers)	
		Pinus (pine)	
		Numerous grains of insect pollinated herbaceous plants (unidentified)	40
		Pinus type tracheids and wood fragments numerous	
2	1-3	Barren	
		Pinus type tracheids present, but uncommon	
3	12	Pinus (pine)	40
		Picea (spruce)	30
		Abies (fir)	20
		Pseudotsuga? (fir)	
		Pinus type tracheids present, but uncommon	
4	24	Pinus, Picea, Abies (low frequency)	
5	26-28	Pinus, Picea, Abies (low frequency)	

The surface sample is fairly representative of the modern flora in the area but just 12 inches below the surface Pleistocene, Late Wisconsin pine-spruce-fir forest evidence is present. Unfortunately the 1 inch to 3 inch sample had no pollen, but I think it is modern.

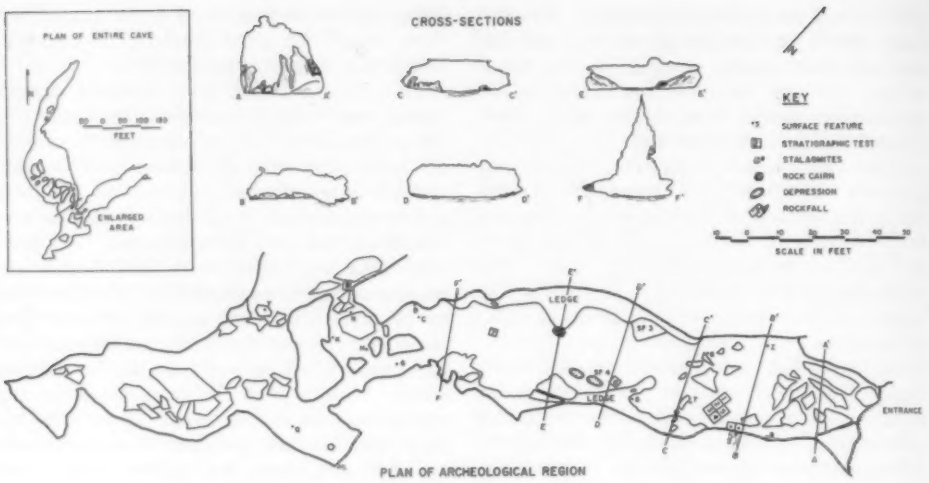

FIG. 4. Plan of N.A. 5686 (Tse-an-Kaetan) showing locations of archaeological features.

about 1 foot and figurines were found scattered throughout. The number of figurines recovered from each of these 5 caches was 5, 14, 16, 18, and 33.

Within the pits the figurines appeared to have no significant order; that is, they did not follow any discernable pattern. For example, in Pit 6 at Tse-an-Kaetan, fourteen were on their left sides and fourteen on their right sides, six faced west, six south, three east, two north, one northeast, one northwest, four southeast, two southwest, and two south-southeast. Twenty-eight were on their side more or less parellel with the level of the cave floor, one was standing up, one tilted down at about a 45° angle and two of the specimens had their heads straight down. In Pit 7 all the specimens on which information was collected were on their right side, but this does not appear significant judging from the other pits and the fact that this count does not include three of the figurines in the pit.

The rat's nest type of cache, instead of being predominantly below the cave surface was above it. It was not covered by rocks but was distinguished by rodent droppings, often solidified, and much other organic material. Again there seemed to be no order to the placement of the figurines. There were about as many figurines in these piles as there were in the rock covered cache pits.

Associated Artifacts. One of the distinguishing characteristics of the Grand Canyon figurine caves was their lack of associated artifacts. Whereas the split-twig objects occurred in great numbers only 14 other items were found that might be attributed to human manufacture and not all of these could be definitely associated with the figurines. These are listed below along with their location and description.

1. Hank of human hair. (Farmer and deSaussure 1955, Fig. 3). Tse-an-Kaetan (Station Q). Without a doubt the most spectacular nonfigurine artifact found was a hank of human hair hanging from 2 sticks stuck in the ceiling of the cave in the first area of total darkness. The hank measured about 10 cm. long and 2.5 cm. in diameter. It was wrapped with string (cotton?). There is no way at the present time of knowing whether or not this was in any way related to the figurines.

2. Juniper "torch." Tse-an-Kaetan (Station R). In a totally dark section of the cave, removed from any figurines, was found a 25 cm. length of juniper which was fire charred at the larger end. This may have been a torch.

3. Spatula. Tse-an-Kaetan (in surface of first passage in total darkness). This item 16.5 cm. long, 2.0 cm. wide, and 4 mm. thick resembled a flat spatula of wood, slightly curved along the long axis with a shallow groove on one side 2 mm. deep. A hole 6 mm. in diameter had been drilled 5.0 cm. in from one end which had cracked to the upper edge.

4. Awl. Tse-an-Kaetan (Station MA). On the floor of the cave in the twilight zone was found a wooden awl 18.8 cm. long and 1.3 cm. wide tapering to a point. It

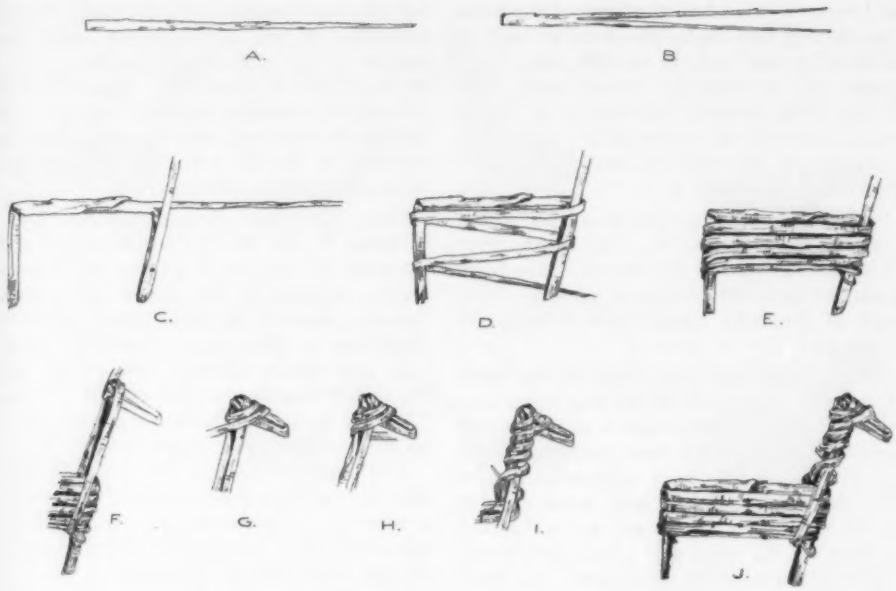

FIG. 5. Basic steps in the construction of split-twig figurines (from Wheeler 1942).

had a disclike cross section with a maximum diameter of 3.0 cm. It was decorated on 2 sides near the top with shallow inscribed holes in groups of two and four.

5. Vine-wrapped stick. Tse-an-Kaetan (S.F.1). At the 3-inch level, with a cache of figurines, a stick 10 cm. long and 4 mm. in diameter, was discovered with a piece of bundled vine less than 0.13 mm. in diameter attached to one end.

6. Small wooden "spear." Tse-an-Kaetan (S.F.1). In the first cache of figurines uncovered a piece of split stick 28.8 cm. long and 1.0 cm. wide tapering to a blunt point was found. This may have originally pierced a figurine.

7. Hammerstone. Tse-an-Kaetan (S.F.5). Above a cache of figurines was found an oval chert nodule derived from an upper Redwall limestone member; it appeared to be a slightly used hammerstone measuring 8 by 7 cm.

8. Projectile point. Tse-an-Kaetan (S.T.4). In the 4- to 8-inch level of Strat-test 4 a chert spear point 7.5 cm. long, 4.0 cm. wide, and 1.8 cm. thick was found. It was generally oval in shape and had an irregular zigzag edge. This artifact was not associated with a cache of figurines.

9. Wrapped chip. Tse-an-Kaetan (S.F.2). In the second cache of figurines uncovered was a triangular chert flake with an altitude of 2.5 cm. and a base, cross wrapped with bark, of 2.0 cm.

10. Sandstone pendant. Luka Cave. On the surface of this North Rim cave was found a rough sandstone pendant about 5 cm. long, 3 cm. wide, and 3 mm. thick with 2 holes drilled from one side. The material appears to be local Coconino sandstone. A pendant similar to this was recovered from Etna Cave, Lincoln County, Nevada, below the Gypsum Cave level which also contained figurines (Wheeler 1942).

11. Other. One awl, a possible arrow foreshaft, and 2 wrapped sticks were found but could not be located for description.

FIGURINE CONSTRUCTION AND VARIATIONS

Construction. All the figurines found during the 1955 season conformed closely to one basic type. This is described below, as are certain variations from it. The basic Grand Canyon figurine type (Fig. 6 *a*) begins with a stick (Fig. 5 *A*) which is split (*B*) for most of its length. The unsplit section is bent at a right angle to form the back leg and top of the back (C). The lower split is bent down and up to form the front leg and continued up to make the neck (C). The [lower] upper split is wrapped back around the body a number of turns (*D*) to complete it (*E*). The split which has formed the neck is bent at an angle to form the first section of the nose. This piece is bent back toward the neck to complete the nose. The free end is then brought down over the head

and forms the second vertical part of the neck. This piece is bent under the body in back of the front leg and back up the right side of the figurine (*E*) to form the vertical body wrap and the third vertical neck piece. It is now wrapped around the crown of the head (*G*), thence around the neck (*I*), and tucked in to complete the specimen (*J*).

Size. Considerable variation in size was found (compare Fig. 6 *k* and *l*). The length from the top of the head to the bottom of the front leg ranged from 14½ inches to 2 inches. The length of the body ranged from 8 inches to 1½ inches.

Horns. Head appendages as shown in Figure 6 *b*, *c*, *p* are a variation of the basic head construction. Their construction is simply a further elaboration of the same technique. At stage *F* (Fig. 5) the neck support is carried above the head and then bent down to form the first horn. The twig is bent under the chin and back up the other side where the process is repeated, forming the other horn. The head and neck are then wrapped to secure the horns and finish off the figurine. On at least one figurine the final neck wrapping was not done, but the second horn element was brought straight down along the neck. The horns and neck of this specimen were wrapped with another piece of material. For the most part the horns were of about equal relative length; however some variation in size was noticed, from lengths of ½ to 1 inch.

A number of horns have supplementary wrapping at their base. Apparently this served to bind the horns more securely and keep them from bowing out of shape. This is invariably done with a smaller element which appears to have been a vine of some kind. The pattern of this work can be seen in Figure 6 *c*.

Horned specimens were found in Tse-an-Kaetan and Luka Cave, but none were found at Tse-an-Sha or White Cave. It is interesting to note that most of the horned specimens came from 2 adjacent caches at Tse-an-Kaetan. Otherwise they were not at all common.

Wheeler (1942, Fig. 29 *B*) illustrates at least one horned specimen from Etna Cave. This is clearly of an entirely different construction from those found in the Grand Canyon. It is difficult to see from the illustration whether the horns are an integral part of the figurine or whether they are a completely different piece, but the latter seems to be the case. The configuration of this appendage at once distinguishes it from the most common type found in the Grand Canyon area. However, Figure 6 *l* shows a deviant specimen which in most respects appears very similar to the Etna Cave specimen in that its horns are not part of the main construction element.

Nose. The nose presents another area of variation in the Grand Canyon figurines. For the most part the size of the nose seems to have been a function of the size of the specimen; however, some of the little animals have relatively long or short noses. Figure 6 *d* shows a long nose which measures 1¼ inches, while Figure 6 *e* illustrates a short nose ½ inch long. The type specimen, Figure 6 *a*, shows a nose of approximately average length.

The angle of the nose also varies; however, this may well be merely part of the construction process, which is not entirely controlled by the artisan, but is influenced by the material. A right angle nose is illustrated in Figure 6 *d*, while a more acute angled nose is illustrated by Figure 6 *f*.

Neck. The wrappings of the neck shows 4 types of variations. The wrapping can be tight and cover the whole neck so that the vertical neck supports do not show as in Figure 6 *g*, or it can be loose as illustrated by the type specimen (Fig. 6 *a*).

A supplementary wrapping is used at times on the neck, usually being of a different material from that of the main construction. Figure 6 *h* has a bark wrapped neck. Others have small vine wrapping, as in Figure 6 *c*. Also, Figure 6 *i* shows a bark addition to the neck; 2 examples of this were found, both at Tse-an-Kaetan.

Necks vary in length, the relative extremes of which can be seen in Figure 6 *d* with a short neck of 1⅓ inches compared to an over-all body length of 3 inches, and Figure 7 *j* with the same body length and a neck 2¼ inches long.

The direction from which the neck is wrapped also varies. Whereas in most specimens the neck wrapping comes from the head down, Figure 6 *k* illustrates a neck wrapping from the body up. This is a result of stopping at stage *F* and wrapping the neck from the bottom up, instead of carrying the element up to the

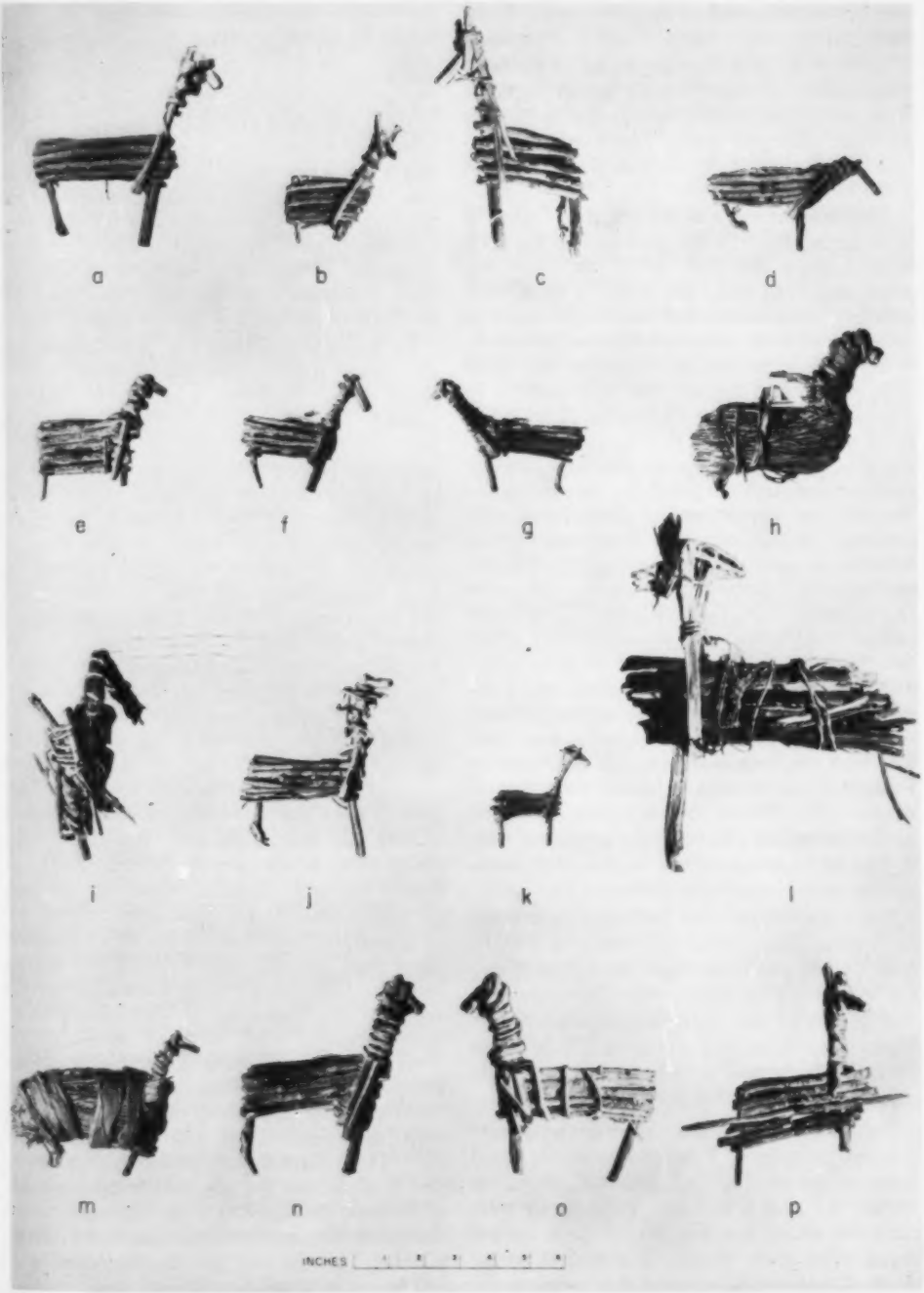

FIG. 6. Variations in figurine construction (for discussion see text).

head wrapping and then down around the neck.

Body. Five variations are found on the body construction of the Grand Canyon figurines. The main horizontal wraps of the body vary between three and seven. This may be a function of the amount of twig that was left at that point in the construction.

One specimen was found which was made of 2 elements (Fig. 6 *l*), the back leg and the body wrap making one unit, while the front leg, neck, and head make the other. This may be a second major type, but since only one was found it has been called a body wrap variation.

On certain specimens supplementary body wrapping is also found. This is illustrated in Figure 6 *m* where a thick bundle of grass has been wrapped around the figurine. Usually, the grass completely covers the body, leaving only the legs and neck sticking out, giving the animals the appearance of being ready for winter. The distribution of these grass-skirited figurines is very interesting. Except for one specimen of uncertain location they all came from Cache 6 in Tse-an-Kaetan. This cache had over 30 figurines in it and of these about one-third are of the grass covered type.

A variation basic in the construction of the figurines is concerned with the number of main vertical body wrappings, whether one or two. The type specimen is shown with one, whereas Figure 6 *n* can be seen to have 2 vertical body wraps. The process involved here is merely double wrapping the vertical element at stage *F*, instead of going directly to the head wrapping after one lap around the body.

Supplementary vertical body wrappings come in 3 forms. Bark or vine (?) wrapping over the grass bundle can be seen in Figure 6 *m*. Vertical body wrapping which comes from the neck and is part of the main twig is illustrated in Figure 6 *o*. A vertical wrapping which covers only the body and is not part of the main construction material is shown in Figure 6 *l*.

Figurines with Spears. During the Grand Canyon expedition 6 specimens were found with miniature "spears" through them, as shown in Figure 6 *p*. Most of the spears were made of sticks, but one was a large mescal thorn. The spear in four of the cases where there is information entered the body on the left and came out the right rear.

Conclusions

The 1955 Grand Canyon Figurine Project was interested in 3 main problems concerning the split-twig figurines, (1) detailed description, (2) chronological placement, and (3) cultural affinities. Fortunately, contributions could be made to the first two of these; however, nothing was learned about the cultural affinities of the figurines. From a series of nearly 100 specimens a fairly detailed descriptive account could be presented, as well as a statement on construction. Variations were also noted and these will no doubt be added to as further finds are made.

Earlier speculation on the upper chronological limit of the figurines was based on distributional data. Evidence is available that the southern section of the Grand Canyon was occupied from at least A.D. 600 by the Havasupai, the ethnographic occupants of this area, and their prehistoric predecessors, the Cohonina (Schwartz 1956a). Although rather extensive archaeological work has been done on this group nothing resembling the figurines has been found associated with it. Furthermore, the north section of the Grand Canyon was distinct culturally from the south as of at least A.D. 600 (Colton 1952: 5), as were the historic inhabitants of the area, the Paiutes, who differed linguistically and culturally from the Havasupai, although they did share certain general traits. On the basis of these data and the fact that the figurines are found on both sides of the Canyon it was suggested (Schwartz 1956b) that they might well date prior to A.D. 600, perhaps being associated with a more widespread cultural complex present in the area before the A.D. 600 split took place.

Substantial confirmation for this hypothesis came from the radiocarbon dating of 2 figurine samples. One figurine from Tse-an-Kaetan was dated by the University of Michigan radiocarbon laboratory (gas method) at 3530±300 years (M-563). A second sample from the same site, but a different cache, was dated by the University of Arizona radiocarbon laboratory (solid method) as 3100±110 years (No. 47). These dates though earlier than expected, did confirm the pre-A.D. 600 hypothesis, but also placed the figurines some 2000 years earlier than anything previously found in the Grand Canyon.

The cultural relationships of these wooden wonders still remain nearly a complete mys-

tery. No material was found associated with the split-twig figurines which would allow for definite placement with any established archaeological complex in the Southwest or the Basin. On the other hand the date suggested by radiocarbon analysis and the figurine distribution would indicate that they may have been part of the widespread Desert Culture.

Any conjectures as to the use or function of these artifacts would be purely hypothetical, but certain informed speculations can be made. Each of the cave locations which contained the figurines had certain characteristics in common: extremely difficult to approach, no evidence of extended occupation, and the occurrence of figurines in fairly large numbers. Furthermore, a number of the figurines had small pointed sticks pierced through them which may have represented ceremonial or ritual killing. It is the feeling of the authors, therefore, that these caves were used for the purpose of ceremonial hunting magic, where, preparatory to the hunt, small animal models were made from split twigs, taken to certain sacred inaccessible caves and ritually killed, buried, or otherwise magically annihilated in order to insure success in the coming hunt.

Even though it is as yet impossible to place these activities exactly in time, or to assign them to any particular group of people, living or dead, it might be useful to set up a Grand Canyon Figurine complex, which with further work can be amplified, refined, and given fuller chronological and cultural placement as new evidence suggests.

The Grand Canyon Figurine complex has at its core the presence of the split-twig figurine. The basic type has been described in this paper, as have numerous variations. The distribution of the complex actually extends beyond the limits of the Grand Canyon (see finds 2, 4, 6, and 11), but until more is known about the non-Canyon finds, the certain distribution will be limited to it. The figurines are always located in extremely inaccessible caves, usually in the Redwall formation, and most are found randomly placed in cache pits in the floor of the caves. Associated artifacts are very rare and nothing has been found which would affiliate them with any recognized prehistoric cultural complex of the Southwest. All the cave sites in the Grand Canyon area appear to have been unoccupied since there is no evidence of middens in the immediate proximity. This, coupled with the fact that some of the specimens are pierced with small "spears," suggests that the whole complex may well be related to hunting-magic ritual.

As is so often the case, this work has raised more problems than it has settled. It is hoped that with the location of further figurine caves and continued archaeological examination of such sites more information will be forthcoming on the extremely interesting Grand Canyon Figurine complex.

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University of Kentucky
Lexington, Ky.

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BURIAL MOUNDS ON THE GULF COASTAL PLAIN

William H. Sears

BURIAL mounds, with their contained structures, artifacts, burials, and the patterns of relationship between these concrete items, represent the largest recoverable body of data in the eastern United States which bears directly on problems concerned with prehistoric religion and ceremonialism. These data in turn are directly applicable, with varying levels of reliability, to problems of prehistoric social and political structure. This is possible through the predictably intimate relationship between supernatural and social controls which obtains in primitive societies.

A certain amount of information applicable to the study of social and religious types may be recovered through the study of community patterns, temple mounds, and other ceremonial structures. For a given amount of work, however, it seems probable that more information directly applicable to the study of social and religious systems can be recovered from burial mounds. They are, by their nature, one of the most important sources available to us of the kind of associations which "reflect human behavior outside of the limits of what ethnologists call 'material culture' and, under favorable circumstances of preservation, may permit study of most aspects of human culture except those, like folksongs and kinship systems, which are wholly dependent on language" (Wauchope 1956: 5).

Granting the limitations of the archaeological record, a number of classes of phenomena occur in burial mounds which are susceptible of interpretation in social terms as well as of classification as artifacts. It is to be remembered of course that, for this purpose, associations and sequences of associations are ultimately of more value than the artifacts, structures, or burials themselves. The fact that a mound contains several kinds of burials may aid in placement of the structure in its appropriate temporal and cultural niche. Associations between burial types, structure types, and artifact classes provide information on ceremonial sequence and, ultimately, on the nature of the ceremonies. An oft noted example, a burial at mound base, in an elaborate tomb associated with artifacts which are ceremonial objects, is often minimally interpreted as that of a person whose social status was very different from that of another individual deposited as a bundle of bones in the top levels of the same mound.

Significant points here are the associations between initial mound building and a burial, between these and an elaborate tomb, between the burial and a class of artifacts, and among all of them as associated evidence of a ceremony. Opposed to this we may have, for example, the association of another burial only with the concluding stages of mound construction. From this we can conclude that a person associated in life with the religious activities of his group had a mound raised over his grave as a memorial and as a product of community effort while another person was simply included. A social relationship with hierarchical implications can certainly be inferred from this minimum amount of evidence.

There are obviously a number of limitations to this approach. Generally, they are of 3 kinds.

1. The normal archaeological limitation of preservation.

2. Cultural limitations. The construction of a burial mound would almost certainly have been in accordance with religious and social

tenets. Yet the religious and social structures may not be reflected in it for a potentially large number of reasons. This means that positive evidence can be used, but that its lack does not necessarily indicate specific absences of features of social and religious structuring.

3. Technical. In older reports particularly, associations were often not observed, not recorded, or not published; sometimes all three. Most of the Gulf Coastal Plain burial mounds from which we have data were dug by C. B. Moore, who reported associations only sporadically.

I have elsewhere defined the Gulf Coastal Plain as a prehistoric culture area (Sears 1956a), in terms of geography and in terms of internal cultural relationship as indicated by the areal spread of the Gulf ceramic tradition. Briefly, the area includes the coastal plain of the Gulf of Mexico from east Texas to Tampa Bay. The ceramic tradition includes, at various points in time and space, flat-based vessel forms, tetrapods, the Weeden Island and Santa Rosa series, and the ceramic series characteristic of the Tchefuncte through the Plaquemine periods and the Alto and Haley foci.

CLASSIFICATION OF BURIAL MOUNDS

Unfortunately, I do not know any way of attempting to make sense out of a large mass of raw data without classifying the data in some way. Even though my most recent attempt at this sort of thing has been characterized as "too narrow and restrictive" (Griffin 1956: 67), the best classification I can devise for efforts at understanding observable regional and temporal variations in burial mounds on the Gulf Coastal Plain is presented below. I have no doubt at all that more information than is available in the published reports might cause me to change the classification of some specimens. Too, there is no doubt that some persons may know of mounds I know nothing about. Either situation might result in changing the classification, since some of the classes may be too inclusive or not inclusive enough. Nevertheless, I have below a start, a point from which to work. With more data we can re-

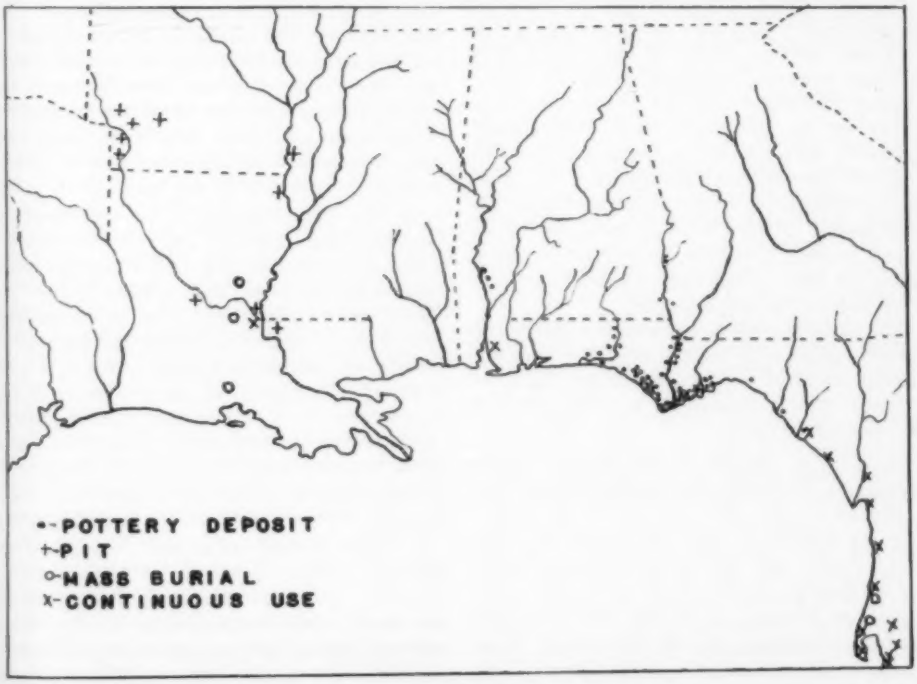

FIG. 1. Burial mound types of the Gulf Coastal Plain.

work, reclassify, and begin to really understand burial mounds and to manipulate the clues they have to offer us as to prehistoric cultural forms and processes.

After inspecting published descriptions of Gulf Coastal Plain burial mounds, inadequate and incomplete although many of them are, it became apparent that there were a number of recurrent patterns or themes. Descriptions of these as "types" follows, with examples of each.

1. *Patterned Burial Mounds.* These are mounds in which a formal, patterned relationship exists between the contained burials, structures or levels, and artifacts. The patterning usually appears to be oriented with respect to some specific one of the included burials. The included burials represent but a small proportion of the total population of the culture producing the mounds.

Specialized mortuary or ceremonial artifacts are a part of such structures, and tend to occur in special caches. The impression is always present, noted by a number of writers including Willey (1949: 369, 404) and Krieger (1949: 206), that some of the burials are those of persons socially dominant in the cultures which built the mounds. Many of the other burials in these patterned mounds appear to be the remains of persons involved in mortuary ceremonialism in subsidiary roles, relationships which we may presume to some degree reflect those which obtained during life. In other words, these large, often complex mounds appear usually to have been produced as the result of a single ceremony in a relatively short period of time. Thus they are interpreted as the product of a complex ritual.

The class as a whole is somewhat difficult to describe in general terms because it has distinctive variants, but its content may be more apparent after a description and discussion of the constituent types.

1a. *Pottery Deposit Type Mounds.* Type specimens, the only ones excavated by controlled techniques, to the best of my knowledge, are mounds D and E at Kolomoki (Sears 1951, 1953). All of the 51 Weeden Island period mounds excavated by C. B. Moore in northwest Florida, southwest Georgia, and southern Alabama are of this type. Three northwest Florida coast Santa Rosa-Swift Creek period mounds are also of the pottery deposit type. Major features of the type, extremely consistent in their occurrence, include the following.

1. A mass deposit of pottery, containing many vessels especially made for ceremonial usage, in the eastern side of the mound.

2. Orientation of all features with respect to the mound center and the east.

3. A central burial in a special tomb type. This cannot be documented from Moore's data in a very high percentage of the 54 mounds.

The special tomb types range from central subfloor pits to burials on the old ground surface covered with oyster shells or rock slabs. Two Alabama mounds, Paynes Woodyard (Moore 1905: 253-4) and Carneys Bluff (Moore 1905: 255-8), are nearly identical to Mound E at Kolomoki in their possession of central subfloor burials with rocks used in a core mound or in grave fill. This is particularly interesting since they are in the northern periphery of the Coastal Plain area in Alabama as Kolomoki is at its northern edge in Georgia.

Another frequently noted characteristic of these mounds is the presence of burials, most often single skulls, in the pottery deposit. The interpretation was made at Kolomoki, where this occurred in Mound D, that these skulls must have been trophies, probably from the temple. There was some evidence, in the form of preserved hair, that these were heads, perhaps mummified in some way at the time of burial.

1b. *Pit Type Mounds.* Type specimens are Gahagan and Haley site mounds. Burials are made in large pits dug down into mounds. Specialized artifacts and pottery vessels are found, often in large numbers, in graves with one or more skeletons. Patterning may be internal, with respect to a single tomb, or a combination of this method and patterning of the tombs as units. The Gahagan mound emphasized patterning of numbers of burials and artifacts in each tomb. The Haley site mound, as Moore suggests (1912: 561) appears to have had the tombs dug in a purposeful pattern.

2. *Mass Burial (Charnel House) Type Mounds.* Type specimens are Greenhouse Mound C and Crooks Mound. These mounds were used one or more times for the simultaneous disposal of large quantities of human remains. Typically, a small platform or primary mound was prepared. Large quantities of

human remains consisting of bundles, flexed burials, and, seemingly, simple piles of bones, were placed on the platform. This mass was then covered by another layer or capping. In the Crooks Mound, many more burials were placed in this second capping or mantle, but since it is interpreted as having been added in a continuous process (Ford and Willey 1940: 28-9), another charnel house must have been the source of these remains. No other organization seems to be present in these mounds. No specific burial received emphasis nor are any artifacts present excepting those directly associated with burials or accidentally introduced with fill earth. The mass "offerings" of the patterned mounds are absent. The Choctaw have described the manufacture of such mounds as a means of disposing of the remains from charnel houses, including one such account in their origin legend (Swanton 1931: 14-18). In distinction to the patterned mounds, the large mass of bodies or bones interred simultaneously seems to indicate that all, or a very large proportion, of the dead of a particular community are present in a mound.

3. *Continuous Use or Cemetery Type Mounds.* Pierce Mound A and the Weeden Island Mound can serve as type specimens. I am not at all satisfied with this class, in spite of the fact that I have placed in it a great many mounds from over a wide area. It is highly probable that functionally different types are being classed together on the basis of physical resemblance. Characteristics are scattering of burials vertically and horizontally, sometimes in very large numbers, without definite signs of layers, developed surfaces, or internal structures. Artifacts, if present at all, occur most often directly associated with the burials. Apparently such mounds accumulated through continued usage, usually in one culture period. Burials were either placed in shallow pits in fresh surfaces, or were placed on fresh surfaces with small amounts of dirt piled over them. Either method is conjecture since neither the pits nor the piles have been recorded with any assurance. Conceivably, such mounds, too, could be charnel house by-products, as the second mantle at Crooks Mound seems to be, with a constant stream of bodies from the charnel house being covered as fast as they were placed. Generally though, it would seem that the amount of organization necessary to build a large mound in this way would be reflected in some recognizable patterning of mound structure and contents. It seems highly probable that this lack of structure, patterning, or concentration of burials or artifacts is a significant indicator of mound building processes.

THE BURIAL MOUND TYPES AND THEIR DISTRIBUTION

1. *Patterned Mounds.* The 2 Gulf Coastal Plain varieties of patterned burial mounds are the best known and most extensively excavated mound types in their respective, and mutually exclusive, areas.

1a. *Pottery Deposit Type.* These mounds, with their masses of specialized vessels buried in their east sides, occur throughout the Weeden Island periods. They do not occur in the later Fort Walton period in which cemeteries or continuous fill mounds take over. Their presence in the Safety Harbor period is possible, since both a mass deposit and killed vessels have been noted in the Safety Harbor burial mound (Willey 1949: 136). Pottery deposit mounds are also known in pre-Weeden Island times, the Alligator Bayou, Andersons Bayou, and Aspalaga mounds, all Santa-Rosa-Swift Creek period structures.

1b. *Pit Type.* These are best known in the far western part of the Gulf Coastal Plain, the "Caddoan area." They range in time there from the Gahagan-Davis level, equivalent to late Coles Creek and early Plaquemine, up at least through the Haley focus, and possibly later. They are also present further east, the Mayes Mound in Louisiana (Moore 1913: 21-32) being a variant of this type. Interestingly, this early Plaquemine period mound (J. A. Ford, personal communication) has a number of deep pits, each having burials made throughout its depth. Burials in these pits are predominantly single skulls and partial secondary burials. A number of the associated pottery vessels have kill holes which were carefully cut through before firing. This is almost the only known example in this area of a normal Weeden Island characteristic. Such pits were also made into the partially completed mound D at Kolomoki, carefully placed so that they did not disturb the core mound. Burials again were made from top to bottom of the pits, and the same emphasis on skulls and partial secondary burials was present. This mound had a

huge east side deposit in which almost every vessel had the kill hole cut through before firing. These 2 mounds, each with some characteristics normal in the other area, represent the only 2 examples of mixture of which I am aware between the features of the pit and pottery deposit types of mounds.

2. *Mass Burial Type Mounds.* Mounds of this type have a broken distribution. They seem to be the earliest type in that part of the Gulf Coastal Plain west of the Mississippi River, although one mound of continuous use type has been noted. None of them are known from the Florida northwest coast nor from the upper west coast. They become important again to the south in the Tampa area.

West of the Mississippi River, Crooks Mound (Ford and Willey 1940) and Greenhouse Mound C (Ford 1951) are well-described examples of the type. It is possible that this type extends into the Coles Creek period, since we do not know the burial mound type for this horizon.

The Lafayette Mound (Ford and Quimby 1945: 21-4) is apparently a mass burial mound. It has been assigned to the Tchefuncte period, but it seems to me that the Plaquemine period is more likely. Earth used to cover burials was from a Tchefuncte period midden, but a secondary capping, quite possibly added almost immediately to complete the structure, contained Plaquemine period sherds. Either this was a 2-phase, single period mound, built in the period indicated by the latest sherds in the fill, or the later mantle, which contains no burials, was added for some completely obscure purpose over a thousand years after the primary mound had been built.

On the lower west coast of Florida, Moore's "Mound Near the Weki-watchee River" (Moore 1903: 425-6) and the burial mound of a burial mound-temple mound complex on the Pithlochascootie River (Moore 1903: 426-33) are Weeden Island period, perhaps late Weeden Island period, examples of this type. Well to the south, the Prine Mound in the Terra Ceia site falls at least partially into the classification, with 11 burials of the twenty-seven observed clustered in one compact mass. Bullen suggests (1951: 34) that this represents a charnel house accumulation.

3. *Continuous Use Type.* These are present in the western part of the Coastal Plain, as indicated by the "Upper Mound on Saline Point" (Moore 1912: 496-500), a Marksville period structure. They become considerably more important to the east and south however. Four out of a total of 7 Santa Rosa-Swift Creek period mounds on the Florida northwest coast are of this type, Huckleberry Landing, Green Point, Yent, and Pierce Mound A (Moore 1902). The other 3 mounds of this period on the Northwest Coast, Alligator Bayou, Andersons Bayou, and Aspalaga (Moore 1902), had east side pottery deposits. This may indicate lateness in the Santa Rosa-Swift Creek period, the pottery deposit reflecting the transition into the next cultural level.

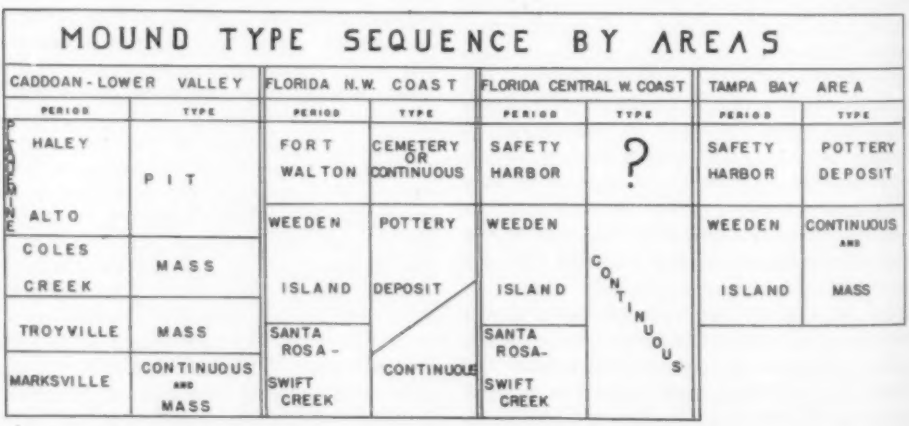

FIG. 2. Sequence chart of Gulf Coastal Plain mound types.

Continuous use type mounds appear to be dominant on the Florida west coast from the Aucilla River to south of Tampa Bay, through a time span from the Santa Rosa-Swift Creek level to the Safety Harbor period. The mass burial type seems to be mixed with them to the south. Continuous use type mounds in the area are: Horseshoe Point, Fowlers Landing, Gigger Point, Bayport, and Crystal River (Moore 1902, 1903, 1918). The Crystal River burial mound appears to have been predominantly Santa Rosa-Swift Creek period while all of the others are Weeden Island period structures. I am also informed (J. M. Goggin, personal communication) that a somewhat disturbed mound at Shired Island, a few miles north of the mouth of the Suwanee River, possessed characteristics which would allow me to place it in this classification.

Recent inspection of the Tarpon Springs collection (Cushing 1897: 352-4; Holmes 1903: 125-8) in the University Museum in Philadelphia indicates that it was a particularly large specimen of this class, with large numbers of pots, sherds, and burials scattered singly and in clusters throughout the mound. Such of Cushing's notes as were available indicated that most pottery vessels were associated with burials.

In all probability, the Cedar Keys "Cemetery" (Moore 1918: 569-71) was another mound of this type, as Willey has suggested (Willey 1949: 309).

All of these mounds have relatively large numbers of burials without observed concentrations at any particular depths or in any specific areas. Artifacts, almost entirely pottery vessels, are found with burials and in clusters of a few pots. Sherds, apparently scattered in the fill, are commoner than complete vessels.

As a general rule, Weeden Island series pottery, restricting the series to that originally defined by Willey (1949: 407) is commoner in mounds than it is in village sites on the central Gulf coast. The limestone tempered Pasco series, the St. Johns series, and others predominate in village site collections in which the plain sherds have been counted. A good example is the Crystal River site midden (Bullen 1953). In this area, even though the especially made mortuary or ceremonial forms of the Northwest Coast are missing, this tendency toward concentration of the Weeden Island series in burial mounds may well indicate a definite relationship of the series to ceremonialism. The vessels in these mounds are killed, but more often by complete smashing than by neatly made kill holes.

In the Tampa Bay area, the Weeden Island mounds excavated under Federal Emergency Relief Agency projects and described in part by Willey (1949), Bullen (1952), or both, are of this type. This would include the Thomas Mound, Parrish Mound 5, and the Jones Mound. The Weeden Island Mound itself, regardless of burials in an old midden beneath it, also appears to be a continuous use mound.

The change in burial type through time which has been suggested for this area by Bullen (1952: 82-3) would not change these classifications, but would in fact support the continuous use thesis.

INTERPRETATION

It is, I think, reasonably certain that the very different treatments of human remains and their associations in the types of burial mounds described is representative of different approaches to supernatural, and hence social, problems. A number of inferences as to the social structures of the cultures which built the different types can be made with varying degrees of confidence. Perhaps the strongest apparent distinction is between the mounds which are indicative of strongly stratified societies and the types which do not indicate strong division into classes as a basis for social organization.

I have discussed elsewhere (Sears 1954) the probable association between the elaborately patterned Mounds D and E at Kolomoki and the Natchez-Taensa mortuary ceremonialism. This was extended to the hypothesis that the mortuary ceremonialism is an integral part of the Natchez-Taensa type of strongly stratified social structures. A mound produced as part of such mortuary ceremonies would then be, in effect, a concrete memorialization of not only the mortuary ceremonies but of the social structure of which the ceremonies were a partial reaffirmation.

A particularly important point here which may be useful in further interpretation is the close relationship between the upper class and the supernatural, the near deification of the "Suns" and the special treatment which went

with this status. In any event, if the mounds indicate special treatment of a limited group, such special treatment, and consequently special social position, must have been a feature of the society. The reverse is not true, since social structure does not have to be reflected in burial.

As noted already, I think it most probable that all of the mounds which contain Weeden Island series pottery, especially made for ceremonial purposes and placed in east side caches, are reflections of very similar sets of ceremonies performed by people of closely related cultures. It might be said that these mounds represent essentially the same culture in spatially and temporally separated communities.

Our other patterned type of burial mound, the western "pit" variant, could easily reflect the same type of social structure. A single mound may have served for a number of ceremonies, with occasional additions to its bulk. At Gahagan, for example, each pit, rather than the mound as a whole, would then be the product of a single ceremony. The dominant motifs of major cultural effort, culture loss of expensive objects at the death of a single individual, and subsidiary burials which might be indicative of retainer sacrifice, are clearly present. Another possibility was suggested, quite correctly I think, for the Haley site by C. B. Moore. Here the major or primary burial was interred in a pit at an early construction stage, while others were later placed in pits dug down from the completed mound surface.

> With the exception of one grave that cut slightly into another, there was no interference between the graves, . . . and one can almost believe, in the absence of this in the mound at the Haley Place, that it was not only erected in honor of the occupant of the great pit below the mound, but that the burials whose graves were dug through the mound, or through parts of it (all probably persons of note, for who ever heard before of such numerous deposits with all the burials in a mound?) were made soon after the erection of the mound when the reason for its construction was still fresh in the minds of men (Moore 1912: 561).

Concrete indicators of relationship between the 2 types of patterned mounds, and between the 2 or more cultures, are such items as apparent retainer sacrifice and deposition of trophies in the form of skulls and long bones, probably from the community temple. This classification as community property as well as ceremonial paraphernalia would also hold for such items as effigy and long-stemmed pipes, Copena-type blades, long stone chisels and spuds, the vessels with precut kill holes from the Mayes Mound, the long-nosed God masks from Gahagan, and the more usual fine pottery vessels which were deposited in such numbers as to impress even the pot-hardened Moore. Association of such large numbers of items with an individual burial, accompanied by satellite or retainer burials in the same grave, as in Moore's pit in the Gahagan Mound (Moore 1912: 511-2) cannot help but be important.

Krieger (1949: 206), in discussing the Haley site, points out that: "All of the skeletons were of adults, and in every determinable case, males. This provides a distinct contrast to the Gahagan, Sanders, and Spiro mass burials which included adult males and females as well as adolescents and children, pointing strongly to mass immolation of relatives and/or servants. The Haley graves do not suggest a parallel in this respect, but of course we have only a partial view of the culture. The exact placement of offerings in these and related graves undoubtedly reflects social and prestige factors." Most of these comments are in line with my suggestions concerning the pit-type mounds, excepting that Moore's note on pit or tomb placement indicates social position as a factor here, in addition to that of offering type and placement.

The continuous fill mounds, with occasional pottery vessels and artifacts placed directly with the dead or in small caches, may be representative of less rigidly organized societies. The burials in these mounds, apparently placed in them singly, or a very few at a time, accompanied by a few special pottery vessels or personal ornaments, do not appear to represent a very high proportion of the population which built any specific mound. Hence the often advanced hypothesis that these persons were the community medicine men or shamans, buried with artifacts which represent, in part, their esoteric paraphernalia. I do not get an impression from these mounds that the persons buried in them, or their successors, exercised any very high degree of social control. The impression is rather that these persons were accorded special treatment in death, but not such special treatment as to involve major efforts on the part of the society. They may well have been the supernatural specialists of their societies, accorded preferential treatment in burial because of their close relationship to supernatural

forces. The evidence does not indicate, to me, that these persons exercised the strong secular control evinced by the patterned mounds.

The Tampa Bay area, Weeden Island period mounds, and possibly some others, may represent a rather different social form. They contain huge numbers of burials, but very few artifacts other than sherds. They may well have functioned as cemeteries for entire communities, special treatment not having been given specific individuals. Quite possibly some sort of patterning was present in some of these which was not recorded. Our choices here are, obviously, either a loose-knit form of social organization, without even minor dominance by the supernatural specialists, or failure to memorialize any more specific social form in mortuary ceremonialism.

Mass burial mounds can perhaps be best understood through a look at the Choctaw who built mounds of this type. The following summary by Swanton (1946: 726) is suggestive. "After the charnel house had become pretty well filled with boxes of bones, a final disposition was made of them. The bone pickers of the various cantons agreed on a day when the grave boxes should be moved, and they were carried to one place in solemn procession, piled into a pyramid there, and covered with earth."

Before going on, it may be well to note that while charnel houses were a common southeastern feature in the 16th through the 18th centuries, from Virginia to the Mississippi River and to the south of Tampa Bay, most of them would, if incorporated in burial mounds, have produced patterned mounds. Only the bodies of upper class persons, treated in various ways, were deposited in these charnel houses. The buildings also served as temples, ritual centers, and storehouses for sacred paraphernalia. Since chieftainship in all of these cultures seems to have been sacred and hereditary, a rather limited number of bodies would be preserved for burial in any one culture period. The mass burial mounds contain, in one burial, huge masses of bone representing a great many individual bodies, covering an area or made into a pile. No individual burial is given any special treatment. A few complete pottery vessels and some sherds may be present, but their association is with the mass of bones or the mound as a whole, and they are probably charnel house furniture.

The Choctaw social system is difficult to characterize. Perhaps the best attempt is Swanton's (1931: 2), based on early accounts.

> Although a certain political centralization had been attained it was not so absolute as to have become spectacular or oppressive and therefore interesting to white men. There were no complicated religious ceremonials to arrest the attention of the foreigner and the intelligence of the native, and it is the general testimony that the Choctaw were less inclined to display their superiority to other people by trying to kill them than is usual even in more civilized societies. The significant things about them are told us in a few short sentences: That they had less territory than any of their neighbors but raised so much corn that they sent it to some of these others in trade, that the beliefs and customs were simple, and that they seldom left their country to fight but when attacked defended themselves with dauntless bravery. In other words, the aboriginal Choctaw seem to have enjoyed the enviable position of being "just folks," uncontaminated with the idea that they existed for the sake of a political, religious, or military organization. And apparently, like the meek and the Chinese and Hindoos, they were in process of inheriting the earth by gradual extension of their settlements because none of their neighbors could compete with them economically.

Fear of ghosts as much as anything else seems to have been responsible for Choctaw treatment of the dead. Certainly the demands of a highly organized and demanding religious structure were not responsible.

I do not see any necessary relationship between charnel houses and large, economically successful societies. It is certainly at least possible, though, that charnel houses, whether their contents ended up in mounds or not, are indicative of such societies as the Choctaw, without strong social or religious forms. The mass burial mounds indicative of charnel houses were first built at an early period on the Gulf Coastal Plain. Some of the cultures in which they first occur later had the patterned mounds indicative of heavily stratified societies with a privileged, sacred, upper class.

I noted above that Weeden Island series ceramics on the Florida west coast occur largely in burial mounds. The village middens run strongly to the Pasco series, the St. Johns series, and other types. These differences in the Weeden Island period between the west coast and the northwest coast are emphasized and corroborated by the differences in burial mound types which have been discussed. Quite clearly, the northwest Florida coast Weeden Island period mounds with their huge east side caches of complete vessels, many of them especially

made for ceremonial function, are not the same sort of thing, culturally, as mounds with burials, potsherds, and a few pots scattered around in them. Both types of mounds were made in the same time period, although new regional terms with more precise cultural meanings are needed, but they are not representative of the same culture. Thus the Weeden Island type site is the burial mound of a very different culture from that represented in any of the northwestern coast Weeden Island period mounds. I venture to predict that in the larger sites at least, there will be definite differences perceptible between the community plans for these several cultures.

It is not possible, at this time, to go very far in comparing the Coastal Plain mound types with those in other areas. A few comments may be made concerning the more obvious areas and types.

I have not been able to find any descriptions, in Moore's works or elsewhere, of patterned mounds in peninsular Florida, excepting possibly the Safety Harbor burial mound. Most of the St. Johns area mounds appear to be continuous fill types, although mass burial mounds may be present. One as yet incompletely excavated mound near the mouth of the St. Johns is of this type (Sears 1957). It is interesting, and probably highly significant, that killed pottery vessels, with some kill holes cut before firing, occur in the St. Johns area. Both Weeden Island and St. Johns series vessels appear to be so treated. With a few minor exceptions in the lower Mississippi Valley, this is the only occurrence of this trait out of its home in northwest Florida, southwest Georgia, and southeast Alabama. This spread to the St. Johns of one ceremonial trait without an accompanying spread of the social and ceremonial structures producing patterned mounds should be of considerable significance for the study of cultural contact and change. Undoubtedly relevant to a study of the processes involved is the fact that the cultures of the northern St. Johns were, in the 16th century, type specimens of highly stratified societies with near divine rulers.

Another mass burial mound is known from central Florida at a Weeden Island time level (Sears 1956b). Others are almost certainly present.

Significant comparisons can be made between Gulf Coastal Plain patterned mounds, especially the Weeden Island variety, and the midwestern Hopewell and Adena mounds, which are of the patterned type defined here, although they do not fit the subclasses. Except for the lack of a mass pottery deposit, they do seem in many ways quite similar to Weeden Island mounds, including such features as tomb types and retainer sacrifice. Thorne Deuel has drawn inferences rather similar to mine from Illinois Hopewell mounds, including a highly relevant comparison with the Natchez (Deuel 1952: 254). A definite class structure has also been posited for Adena by Spaulding (1952: 212). It would seem that a highly organized type of social structure, theocratically oriented, with a semidivine upper class, developed in the Midwest long before it did on the Gulf Coast.

Disregarding, for the moment, radiocarbon dates suggesting either Midwestern or Lower Mississippi Valley priority for Hopewellian ceramics, certainly contact between the 2 areas did take place or nearly identical ceramic styles would not be present in the 2 areas. The form of social organization present in the Midwest then appears to have reached the coast somewhat later, where it persisted until the historic period. On the other hand, the appearance of temple mounds, usually as a part of complex community plans, argues for a higher degree of social organization than do the smaller, less complex communities with only burial mounds. Many of the sites on the coastal plain, the burial mounds of which are classified in this study, have temple mounds too, of course, and in some cases, as at Kolomoki, both are parts of very complex community patterns. On the whole, however, it would seem that the type of social organization present in the later midwestern sites was not reflected in burial customs. Since we can readily recognize only strong social stratification, and possibly its absence, in the archaeological remains of mortuary ceremonialism, this stratification may not have been present in these Mississippian societies. As with such groups as the Choctaw, sacred specialists, as well as political leaders, would have been present but would not possess strong secular control. They would administer rather than organize, administer according to old convention and custom. For example, the demands of busk ceremonialism could produce a temple mound as a result of concerted community effort without any over-all control of community affairs.

To summarize, it is possible to recognize that 3 distinct kinds of burial mounds were built on the Gulf Coastal Plain. They are the Patterned Type, subdivided into the Pottery Deposit Type and the Pit Type; the Mass Burial or Charnel House Type; and the Continuous Use or Cemetery Type. Their interpretation is based on the premise that the mounds are concrete memorializations of rituals, and thus can be indicative of religious and the interrelated social structure. The patterned mounds, from both direct interpretation and by comparison of reconstructed ritual with Natchez funeral ceremonies, appear to have been produced by strongly stratified societies. Mass burial mounds are a type produced by the ritually and socially amorphous Choctaw, and so may be indicative of the existence of societies with loosely structured social and religious systems. Continuous use mounds, a class somewhat lacking in internal consistency, may, depending on the specific instance, result from either a series of simple burials which do not reflect the social-religious structure of the society involved or have been produced by simpler societies where such structure has not developed definite form.

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THE PROBLEM OF THE STUDY OF THE MAYA HIEROGLYPHIC WRITING

Y. V. KNOROZOV

TRANSLATED BY SOPHIE D. COE

UP to the present time, some specialists have held to the view that on the American continent before the European colonization, there was no writing in the true sense of that word. The various systems of writing used by the Indians were regarded as pictographic or ideographic. However, it is now known with certainty that the civilized peoples of ancient America — the Maya, Zapotec, Olmec, and also the Quechua and Aymara — had hieroglyphic writing of the same type as that of the Old World, of China, Egypt, Sumeria, and so forth.

Hieroglyphic writing, as distinct from pictographic, transmits the sounds of speech, and the most characteristic thing about this system is that it has 3 categories of signs; ideographs, phonetic signs, and key signs, with the signs having many meanings and approximating the transmission of the phonetic composition of the words.

In Mexico and Central America, there have been found hieroglyphic writings of 3 peoples: the Maya, the Zapotec, and the so-called Olmec.

The ancient cities of the Maya are disposed in 4 main groups. In the principal group, near Lake Petén Itzá, is the most ancient and largest of the Maya cities, Tikal. Around it are many other ancient settlements, including Uaxactun, where the earliest dated Maya inscription is found, 4th century A.D. The southern group includes Quirigua and Copan, the second city in size after Tikal, with remarkable sculptures and architecture including the celebrated Hieroglyphic Stairway. The southwestern group includes the cities in the valley of the Usumacinta: Palenque, Yaxchilan, Bonampak, Piedras Negras, and even further to the southwest, Tonina. The northernmost group consists of the cities of Yucatán, of which the most famous are Chichén Itzá, Uxmal, and Mayapan.

In many Maya cities there have been discovered large numbers of inscriptions on stone. At the end of the 19th and beginning of the 20th century, a large body of literature grew up around these inscriptions. Besides this, in European libraries were found 3 Maya manuscripts, the so-called Dresden, Madrid, and Paris codices, brought from America in the 16th century.

"Olmec" is the name usually given to an unknown people who lived on the shores of the Gulf of Mexico in the states of Tabasco and Veracruz. The monuments of the "Olmec" civilization are mainly known from the excavations of Stirling in La Venta, Tres Zapotes, and Cerro de las Mesas. Very few "Olmec" hieroglyphic inscriptions have been found: a stela from Tres Zapotes, 3 stelae from Cerro de las Mesas, and the inscription on the Tuxtla Statuette.

The total number of signs or symbols in "Olmec" inscriptions is about fifty. Approximately one third of all these signs are close variants of Maya signs. "Olmec" inscriptions have dates written in the same numbers that the Maya used, a bar for 5 and a dot for one. The writing of the "Olmec" is absolutely unstudied.

In the study of the ancient civilization of the Zapotec, in the state of Oaxaca, the main role has been played by the excavations of the Mexican scientist Alfonso Caso. The most important centers here were Monte Alban and Mitla. In Monte Alban have been discovered more than 20 hieroglyphic inscriptions, mainly on stelae. The most ancient inscriptions, composed of 3 or 4 hieroglyphs, are engraved on the stone slabs

FIG. 1. Proposed readings of a selected group of Maya glyphs.

with the representations of the so-called "Danzantes." Besides this, there have been found inscriptions in Cuilapan, Xoxo, 5 inscriptions from Zachilla, and more than 15 inscriptions without provenience. More than 50 Zapotec inscriptions have been published.

The total number of signs in Zapotecan inscriptions is about one hundred. Some signs are very close to Maya signs; however, most of them are distinct from both the Maya and the "Olmec" signs. Alfonso Caso has defined the Zapotec hieroglyphs which signify the day names, using similarities between the Maya, the Zapotec, and the Aztec calendars.

The Central American hieroglyphic systems of writing strongly influenced the pictographs of neighboring tribes and peoples. In the ruins of the Toltec city of Tollan, there are found isolated signs which resemble Maya and Zapotec hieroglyphs, but not one inscription has been found. According to the Mexican historian Ixtlilxochitl, theToltecs had books which recorded historical events and prophecies. No Toltec manuscripts have survived, but there are many later Aztec manuscripts which apparently follow the Toltec tradition. Aztec manuscripts were pictographic; they usually represent a row of scenes, each of which portrays a whole story or more rarely, a sentence. The main pictographic text was often filled out by separate words written with the help of ideograms and phonetic signs, that is to say, hieroglyphically. However, hieroglyphs were never used to write down whole phrases, but exclusively to transmit personal names, geographical names, and dates. Thus, the Toltecs and the Aztecs had just the beginnings of hieroglyphic writing, as a supplement to their pictographs. Aztec hieroglyphs are almost completely unstandardized; several signs coincide with those of the Maya and Zapotec.

The 3 Central American systems of writing — Maya, Zapotec, and "Olmec" — are very similar to each other, and it is hardly possible to deny their common origin, in spite of the fact that many Zapotec signs have no Maya analogies. "Olmec" writing is undoubtedly closer to Maya writing than to that of the Zapotecs. However, one must note that the Maya and the Zapotec belong to different language families, while the linguistic affiliation of the "Olmec" is unknown. All 3 systems have many traits in common. The signs are usually enclosed in an oval or a rectangle. Figures of people or animals are usually not met with; their heads only are represented in profile, the so-called face signs. The signs are usually joined together in groups which correspond to words. The lines go from left to right and from top to bottom. All 3 systems of writing use the same numeration.

The most ancient writings of all these 3 peoples go back to the beginning of our era. Most scientists concur that writing goes back to the first centuries B.C. Before we decipher the Zapotec and "Olmec" writing, there is no way of telling how closely connected they are to Maya writing, or which people first invented writing. However, the correspondence between the names of represented objects and the phonetic reading of signs among the Maya give us the possibility of supposing that hieroglyphic writing arose among the latter. This supposition is supported by the fact that it is among the Maya where we find the greatest number of written texts.

In the number of preserved texts, Maya writing has no rival on the American continent. Until the hieroglyphic texts are studied, it will be impossible to study fully the civilization of the ancient Maya. Besides this, the study of Maya writing will probably significantly lighten the task of deciphering the Zapotec and "Olmec" inscriptions.

Although Maya writing has been studied for about a hundred years, it was deciphered only in 1951 (Knorozov 1952, 1955a, 1955b, 1956). The term "to decipher" is often misunderstood. Some authors consider as decipherment any plausible interpretation of unknown signs. Others consider as decipherment the full finished translation of texts written in an unknown script. Both of these are wrong. By various indirect clues, we can determine the meaning of separate hieroglyphs. If one can determine the meaning of a hieroglyph, it does not follow from this that the hieroglyph can be read. For instance, the representation of a dog in Maya manuscripts is accompanied by a hieroglyph made out of 2 symbols. There is every reason to believe that this hieroglyph transmits the word "dog." But, in the Maya language there are several synonyms all meaning "dog." Moreover, it is unknown how far the ancient pronunciation differs from the modern. It is also possible that many words of the ancient language are not in the modern language. The determination of the meaning of a hieroglyph gives one the possibility of indicating the meaning of the word written by that hieroglyph, though it

remains unknown exactly what word it is, and how it is to be pronounced. If the meaning of a row of hieroglyphs is correctly determined, it becomes possible to try a reading.

In contrast to the determination of the meaning of separate hieroglyphs by indirect clues, decipherment is the beginning of an exact phonetic reading of words written in hieroglyphic form. As a result of decipherment, the study of texts becomes a branch of philology.

The meaning of many Maya hieroglyphs is known from 16th century sources. Twenty day hieroglyphs and 18 month hieroglyphs were translated in the work of Diego de Landa (Tozzer 1941). Landa also transmits the name in Spanish letters of each day in the month corresponding to the hieroglyphs. In other manuscripts of the colonial period, there are translations of the ancient Maya numbers. Knowing the numbers, the hieroglyphs of the days and the months, and the Maya calendar, the first investigators of the 19th century could, on the basis of arithmetical calculations, determine the meanings of a series of hieroglyphs. Maya manuscripts are basically of calendrical content, and each paragraph concerns one day or another and its position in the week (the Maya had a 13-day week, the days of which were unnamed but were indicated by numbers). As the dates in the paragraphs of the manuscripts go in a strictly determined order, it is not very difficult to compute the desired date, even if it is entirely obliterated. In several instances, the number of the week was represented by a hieroglyph and not a number. For instance, on page 19 of the Dresden Codex, the number of the week before the paragraph is expressed by a hieroglyph composed of 3 signs. Arithmetical calculation shows that this should be the number 11. Similarly, on page 9 of the same manuscript, instead of the number 3, there is a hieroglyph of 2 signs. In the same way, by arithmetical computation, the hieroglyphs signifying 0, 20, and so forth were determined. 20th century investigations almost exclusively have tried to determine the meaning of hieroglyphs by arithmetical computation. By this way one can, of course, determine the meaning of only those hieroglyphs which are connected with counting. A few such hieroglyphs were found, but even their meaning was determined in a very approximate fashion, for instance "hieroglyph counting ahead," "hieroglyph counting backward."

How these hieroglyphs are read, of which the meaning has been determined, remains unknown. To signify the hieroglyphs of the days and the months, investigators used the names given by Landa, even though these are in many cases not the readings of the hieroglyphs. Other hieroglyphs are signified merely by a European word or by a Maya word approximating the meaning.

By means of comparing the text and the drawings in Maya manuscripts, it has been possible to determine the meanings of a series of hieroglyphs transmitting the names of animals: dog, turkey, parrot, jaguar, and others. These determinations were based on the fact that above the representations of some animal, for instance the jaguar, one usually finds one and the same hieroglyph. In several instances, such determinations turned out to be correct. In a similar way were determined the hieroglyphs of the gods. As it remained unknown just who these gods were, they were labeled by letters of the Latin alphabet: God A, God B, and so forth.

The decipherment of Maya writing has been made significantly easier by the fact that Landa appended to his work a list of 30 alphabetical and syllabic signs. However, many of Landa's signs were written so unclearly that for a long time they could not be read. Besides this, Landa, for one and the same sign, gave several completely different readings. For instance, the sign for the day *Cauac* figures in the composition of the hieroglyphs for the months Yax and Ceh and also as a syllabic sign *cu*. For many investigators these contradictions seemed insuperable.

Attempts to decipher the Maya writing, that is to say, to go from interpreting the meaning to an exact phonetic reading of the hieroglyphs, were often undertaken in the 19th century. The greatest success was attained by the French scientist Léon de Rosny (1876). Using the Landa alphabet, he first correctly read the word for "turkey" (*cutz*), written by 2 phonetic signs, and first correctly explained the character of Maya writing. Besides this, he determined the hieroglyphs for various colors and the world directions, even though he could not read them. The example of Léon de Rosny was followed by an American scientist, Cyrus Thomas (1893), who succeeded in reading 3 more words: *moo* for "parrot," *kuch* for "vulture," and *le* for "trap." However, the correct reading for separate words by Léon de Rosny and Cyrus Thomas had an accidental, unsystematic character with a complete absence of convincing

cross-readings (when one and the same sign is read in the same way in different words). Only now has it become clear which of the many readings suggested by these scientists are really correct.

The opponents of the phonetic reading of the hieroglyphs succeeded in the beginning of the 20th century in negating all the achievements of the French school of decipherment. The few correct readings were almost entirely ignored. In the denial of the first efforts of decipherment, a basic role was played by the theoretical views which came into popularity in the 20th century. Maya writing began to be regarded as ideographic. The possibility of alphabetic signs was completely denied and the signs were all read as ideograms, symbols, or rebuses. Stemming from such a theoretical background, Eric Thompson (1950: 78) interprets, for instance, the hieroglyph of the dog in the following fashion. The hieroglyph consists of 2 signs; the first sign depicts the rib of an animal and appears to be the symbol of the dog, while the second sign is the symbol of death. The combination of the symbol of the dog and the symbol of death is explained by the fact that the dog accompanies the shades of the dead to the world beyond the grave. In the opinion of Thompson, such an interpretation is a true decipherment. It is clear that such a "decipherment" cannot help us make sense out of any other hieroglyph. Thompson (1954: 167) says as much: "The decipherment of new glyphs does not appreciably simplify the task of tackling the remainder, as in a crossword puzzle or in a writing which employs an alphabet."

As shown above, we understand as decipherment the *exact phonetic reading* of the hieroglyphs. Such as decipherment appears to be the key to reading of the texts, because using the already known signs we can read any new word in which these signs appear. Obviously, decipherment in this sense is based on the thesis that any hieroglyphic writing is the recording of the sounds of speech. The criterion of the correctness of the decipherment is cross-reading. If the sign is read in the same way in several words, this gives us a reason to consider this reading correct. To illustrate the correctness of the decipherment offered by the author of this article in 1951, one can append several examples of such readings.

Landa, in his alphabet, gives a sign for the syllable *cu* (Fig. 1, *1*). This sign is the first element in the hieroglyph for turkey (Fig. 1, *11*), the meaning of which is determined by means of comparison of text and drawings. In the Maya language there are 2 synonyms to express the concept "turkey": *cutz* and *ulum*. One can suppose that the hieroglyph for turkey is a phonetic recording of the word *cutz* and that the second sign in this hieroglyph (Fig. 1, *2*) is read as *tz*. The sign *tz* stands first in the hieroglyph for dog (Fig. 1, *12*), the meaning of which was determined by the comparison of text and drawings. The second sign in the hieroglyph for dog is transmitted by the Landa alphabet as the sound *l* (Fig. 1, *3*). In the Maya language there are several synonyms to transmit the meaning "dog": *pek*, *tzul*, *ah-bil*, *bincol*. One can suppose that the hieroglyph for dog is the phonetic recording of the word *tzul*, as the first sign of the hieroglyph is read as *tz* and the second as *l*. If these readings are correct, and they are upheld by the Landa alphabet and the indirect determination of the meaning of the hieroglyphs by way of comparison of text and drawings, one concludes that one and the same symbol can be used both syllabically and alphabetically. As noted above, on page 19a of the Dresden Codex, instead of the number "11," there is written a hieroglyph of 3 signs (Fig. 1, *13*). It is natural to suppose that this hieroglyph is a phonetic transcription of the number "11," *buluc* in the Maya language. The meaning of the first sign is unknown. The second sign in the Landa alphabet and in the hieroglyph for dog is read as *l*, and the third sign is read in the Landa alphabet and in the hieroglyph for turkey as *cu*. One obtains the reading *?-l-cu*. From this one can conclude that the word *buluc* is written here; besides which, the first sign (Fig. 1, *4*) is read as *bu*, the second can be read not only as *l* but as *lu*, and the third not only as *cu* but as *c*, all of which upholds our previous observations. In the inscription from Yula (1B5), one encounters a hieroglyph composed of the same 2 signs as the hieroglyph for turkey (Fig. 1, *14*), but with the difference that they are in reverse order. It follows that this hieroglyph is read *tzuc*, which means "group." Such a reading can be upheld because of the presence of the number 4 (4 dots) in front of this hieroglyph, since "four groups" (*can tzuc*) played a significant role in Maya history. On page 37a of the Dresden Codex, a phrase begins with a hieroglyph (Fig. 1, *15*) composed of 2 signs. The

first of them is *l* (*lu*) and the second *b* (*bu*). It follows that the hieroglyph is read as *lub*, "to fall," "to rain" (in the combination *lub chaac*). Such a reading is fully substantiated by the drawing which accompanies the text.

From this it is clear that the reading of the hieroglyphs in which one of the known signs occurs is not difficult if the lexicon is sufficiently well known. Let us inspect another example. Landa in his alphabet has the sign *k* (Fig. 1, 5). In the third example of the writing of words given by Landa, this same sign transmits the syllable *ka* in the word *kati* (Fig. 1, 16). It follows that this sign, like those treated above, can be used both syllabically and alphabetically. In the Dresden Codex, one often meets with a hieroglyph (Fig. 1, 17) which, judging from the drawings accompanying the text, could mean "offering" or "to take." The hieroglyph is composed of 2 signs. The first sign, according to Landa, is read as *k*(*a*). The second sign (Fig. 1, 6) transmits, also according to Landa, the syllable *ma*. Therefore, the hieroglyph is read as *kam*, "to receive." On page 7 of the Paris Codex, one meets with a hieroglyph composed of 3 signs (Fig. 1, 18). According to Landa, the first sign is read as *u*, the second as *ka*, and the third as *ha*. One obtains the reading *ukah*, "thirst" (a common word in prophetic texts). In the end of the Madrid Codex there is a chapter about bees. In this chapter there is constantly repeated a hieroglyph made out of 2 signs (Fig. 1, 19); the second of them is read *k*(*a*), while the first is unknown. It is natural to suppose that this hieroglyph is read *pak*, "to carry honey." Such a reading is supported by drawings and by the use of the sign *p*(*a*) in other hieroglyphs.

In the same fashion the symbol *c*(*u*) is read similarly in the Landa alphabet and in the words *cutz*, *buluc*, and *tzuc*. The symbol *l*(*u*) is read similarly in the Landa alphabet and in the words *tzul*, *buluc*, and *lub*. The symbol *k*(*a*) is read similarly in the Landa alphabet and in the words *kati*, *kam*, *ukah*, and *pak*. The symbol *m*(*a*) is similarly read in Landa's third example (*ma in kati*), in the word *kam*, and in the name of the god Mam (Fig. 1, 20), read by David H. Kelley (personal communication), and in other examples.

All these are cross-readings and fulfill the requirements we have set up for decipherment. They are sustained also by the Landa alphabet and by the indirect determination of the meaning of the hieroglyphs by way of arithmetical computation or by the comparison of text and drawings.

The decipherment has given us the opportunity to begin the study of the language of the hieroglyphic texts. There is every reason to believe that the texts are written in the language of the time when hieroglyphic writing was invented (first centuries B.C.). This ancient language became literary and sacred. The priests wrote it until the Spanish conquest, while the spoken language in 1500 years had strongly changed in all respects. To study the language of the hieroglyphic texts, it is necessary, of course, to determine the reading of all the signs, which in Maya writing total about 300. This work is not yet finished. The greatest difficulty is presented by the reading of the ideograms. Even in those cases where the meaning of the ideogram is clear, it is hard to determine which word they transmit. One can exactly determine the meaning of an ideogram only when it is used also in the quality of a phonetic sign, as, for instance, the ideogram for "sun" (*kin*). One can also use the instances in which the ideogram is replaced by a phonetic transcription. For instance, the words *cutz* (turkey) and *moo* (parrot) are found in both ideographic and phonetic notation.

An ideogram is commonly defined as a symbol transmitting a word. Such a definition is also found in my previous articles. However, more exact observation shows that an ideogram can transmit only the root. An ideogram cannot transmit the root with affixes, that is to say, the grammatic form of the word (having in mind, of course, synthetic and not analytic forms). This observation is fully upheld by the use of ideograms in hieroglyphic systems of writing of the Old World.

Every language has an upper limit for the phonetic composition of the root of the word. A root can be, for instance, one syllable, 2 syllables, or 3 syllables (or, similarly, 2 radicaled or 3 radicaled, counting as a radical a consonant sound with a weak vowel). As both ideograms and phonetic signs in hieroglyphic writing have the same origin, then neither the ideogram nor the phonetic sign can transmit more sounds than the maximal phonetic composition of the root of the given language. In the Maya language, the roots are one-syllabled, an open or a closed syllable. From this it follows that no ideogram or phonetic sign in Maya

writing can transmit more than a closed syllable. Because of this, the ideogram for "jaguar" cannot be read *balam* or *bolay*, as in both these words the endings *-am* and *-ay* are suffixes. In the same manner, the ideogram for "owl" cannot be read as *muan* because this word has the suffix *-an*, which cannot be expressed by an ideogram.

Phonetic signs in Maya writings always transmit only one syllable. The composition of these syllables is exactly the same as that of the roots of the Maya language; they can consist of one vowel sound (type A), a vowel and a consonant (type AB), a consonant and a vowel (type BA), and 2 consonants with a vowel in between (type BAB). The signs for open syllables are also used for the transmission of separate consonant sounds on the end of a word and therefore are better termed the alphabeto-syllabic type B(A). A wide use of these signs is a characteristic of Maya writing.

As there are several alphabeto-syllabic signs for one and the same consonant sounds but with different vowels, for instance *k*(*a*), *k*(*u*), *k*(*e*), it would seem to make no difference which of these signs was used to transmit one consonant sound at the end of the word. However, Maya scribes held rather strictly to the following orthographic rules: to transmit a consonant sound at the end of a word, one must use such an alphabeto-syllabic sign that the presumed vowel at the end of this sign corresponds to the preceding vowel sound. Such a mode of writing might be called synharmonic. Thus, in the word *tzul*, they used the alphabeto-syllabic sign *l*(*u*), while in the name of the goddess Chel, they used the sign *l*(*e*). Synharmonic writing is undoubtedly in the majority, although there is a series of exceptions. For instance, in the word *kuch* ("vulture"), they used the sign *ch*(*e*) and not *ch*(*u*). David H. Kelley, in a letter of 27 January, 1957, offered a very interesting explanation for this phenomenon. According to him, the roots of the ancient Maya language were 2-syllabled. The last vowel was usually the same as the preceding one, even though there were exceptions. This supposition of Kelley is upheld by several observations on the Maya lexicon. If this turns out to be true, we can suppose that the hieroglyphic inscriptions fixed the last vowel sound in the root, which has long since disappeared in the modern Maya tongue.

The phonetics of the ancient literary language of the Maya are certainly significantly different from the phonetics of the spoken tongue of the Maya at the time of the Spanish conquest. Regarding vowel sounds, we must first of all note the wide distribution of synharmonism in the modern language. In intransitive verbs, the vowel sound of the suffix *-hal* changes to correspond to the vowel of the root, while the consonant sound *h* disappears, as the result of which we have verbs of the type *hanal*, *cimil*, and *ukul*. In verbs of the passive voice, vowel sounds of the suffix *-bal* undergo the same change, while the consonant *b* disappears. This process of the synharmonization of verbs was in full swing at the time of the Spanish conquest, while in the ancient language it does not exist.

The pronunciation of consonant sounds has also significantly changed. We can note the regular shifts of *t* to *ch*, and *ch*, to *c*. The ancient words *te* ("tree") and *chaan* ("sky") are pronounced in the modern language *che* and *caan*. The ancient language had the sound *ng*, which in the new language has changed to *h* or *n*.

In the same way, we must note several important changes in the grammar. In the modern language, there appears a group of proper names as a result of the shift in meaning of the prefixes *ah* and *ix*, which in the ancient language did not indicate sex. There have been especially marked changes in the conjugation of verbs. Intransitive verbs in the ancient tongue had the suffixes *-ngal* (present tense), *-ngi* (past tense), *-ngom* (future tense). Later, these suffixes began to be pronounced in some cases as *-hal*, *-hi*, and *-hom* (*-om*), and in other cases *-nal*, *-ni*, and *-nom*. Only in a few verbs has the archaic suffix for the present tense been preserved, as in *lolancal* ("to bloom") (past tense *lolni*). In these instances, the archaic sound *ng* emerges as the combination of consonants *nc* or sometimes *nh*. Besides, as noted above, there has taken place the synharmonization of many intransitive and passive verbs. One must also note the disappearance of the suffix for the future tense *-om*, which is noted as an archaism in sources of the colonial period. Later there appeared analytic conjugations with the help of time particles agreeing with pronominal affixes. In connection with this, the bases for the present and future tenses changed

in transitive verbs. In the ancient language, there was a preponderance of suffixial conjugation.

The study of the lexicon of the language of the hieroglyphic texts is made much more difficult by the fact that, up until now, the lexicon of the language of the colonial period is very poorly known. Even the most important dictionaries of the Maya language, including those of Vienna and San Francisco, have not been published. However, all the dictionaries, copies of which are available to overseas specialists, are insufficient to translate even texts of the colonial period. In the so-called Books of Chilam Balam, written in Maya with Spanish letters and mostly unpublished, we find so many senseless and doubtful words that the translations made by different authors are completely dissimilar. It is enough to juxtapose the translations of Ralph Roys, Alfredo Barrera Vásquez, and Maud Makemson to become convinced of this.

If in the books of Chilam Balam we meet with so many incomprehensible words which are extremely difficult to translate, then, in the ancient hieroglyphic texts the matter is obviously much worse. In them we encounter a certain number of comprehensible words amidst an obscure and dubious context, having no analogies either in dictionaries or in the texts of the colonial period. There is, of course, nothing amazing in this, as the language of the hieroglyphic texts is 1500 years older than the known, or to be more correct, very poorly known, Maya language of the 16th century. Because of this, it is impossible to expect rapid success in the reading of the hieroglyphic texts. On the other hand, it is exactly this circumstance which makes the Maya language especially interesting for philologists, as up till now it is the one language on the American continent the development of which we can trace through almost 2 millennia, from the dawn of our era to modern times.

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INSTITUT ETNOGRAFII AKADEMII NAUK
Leningrad, U.S.S.R.
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ANCIENT MESOAMERICAN MORTARS, PLASTERS, AND STUCCOS: COMALCALCO, PART II

EDWIN R. LITTMANN

THE INITIAL paper in this series (Littmann 1957, AMERICAN ANTIQUITY, Vol. 23, No. 2, pp. 135-40) presented a systematic approach to the study of ancient building elements such as mortars, plasters, and stuccos, and set forth the bases upon which the work was undertaken. It also included studies on steps of the prebrick period of Temple IV at Comalcalco, Tabasco, Mexico, in which it was demonstrated that a building unit comprising a monolithic lime-aggregate structure covered with a thin, lime-based wash coat followed by a thicker coat of plaster was used. Such a unit appeared to have been used in both the original structure and subsequent additions or modifications throughout the prebrick period.

The earlier work has now been extended to include mortars and plasters of the brick period, obtained from the sanctuary of Temple IV and the Palace, and stucco from Temple IV. The methods of analysis used are those described in the earlier publication.

On-site Observations and Sampling. Mortar and plaster samples were taken from newly excavated areas and were removed from the structure with a knife blade or chisel. In most cases, unbroken samples of plaster as large as 10 by 10 cm. could be obtained. By careful manipulation, mortar samples as large as 3 by 10 cm. could be pried from the spaces between bricks. The samples of stucco were picked up from the area where they had fallen to the floor of the sanctuary as a result of the collapse of the upper part of the structure.

Preliminary examinations of the samples disclosed no unusual features of structure or composition, though later and more detailed examinations showed the initial observations to be in error. All samples had, superficially, a gray, limey appearance and tended to dust moderately upon handling. The mortars and plasters, including the floor of the sanctuary, showed no evidence of lamination or the use of a unit type of construction as observed in the case of the steps of Temple IV. The samples described in detail below have been assigned analytical numbers which are in sequence with those used in the initial paper. For future reference, it should be noted that an individual series of analytical numbers will be used for each site studied.

Sample No. 11. Plaster, covering the bricks of the vertical wall of the center room of the sanctuary of Temple IV. The plaster was readily pried from the wall and was sufficiently cohesive that it could be handled without excessive crumbling. It had a characteristic limey appearance on both the inner and smoothed, outer surfaces and showed no evidence of lamination or multi-coat application. Small shell fragments and some carbon were visible throughout the sample, which was about 2 cm. thick.

Sample No. 12. Mortar, between the bricks of the vertical wall of the center room of the sanctuary of Temple IV. The sample was taken from the area immediately adjacent to that of Sample No. 11. The plaster had fallen from the sample area. The mortar was of coarser texture than the plaster and contained larger amounts and larger pieces of shell. It was removed by careful prying with a small chisel and could be handled without appreciable crumbling. The sample also had a limey appearance and was approximately 3.5 cm. thick.

Sample No. 13. Plaster, covering the floor of the center room of the sanctuary of Temple IV. The plaster was similar in appearance to that obtained from the wall of the same room, though the shell and carbon particles appeared somewhat larger. The sample showed some evidence of having been originally smooth on the outer surface, though it was pitted at the time of collection, probably as a result of weathering. As taken, the sample was about 1.5 cm. thick. The total depth of plaster or the composition of any lower layers were not investigated.

Sample No. 14. Stucco, center room of the sanctuary of Temple IV. Two samples were picked up from the floor of the sanctuary. One (Fig. 1) was essentially semicircular in cross section and was apparently attached to the base plaster at the flat, back surface. The sample was about 6 cm. wide at its base and 3 cm. thick. The other (Fig. 2) was a fragment of rectangular shape with a circular protuberance extending from one side. The unusual feature of both samples was their multilayer composition, which consisted of a soft, light gray core covered with a dark gray, hard dense layer which, in turn, was coated with a light gray plaster. The dark, intermediate layers conformed to the contours of the samples and extended through their length. This is shown in Figure 1 for the semicircular sample. The sawn section of the rectangular sample at the top of Figure 2 shows the L-shaped layer, again conforming to the angular portion of the sample. The circular protuberance showed no evidence of an intermediate layer. In the semicircular sample, the outer plaster layer was 1 to 2 mm. thick, the

dark gray layer about 2 mm. thick, and the core about 2 cm. thick from front to back. The thickness of the several layers in Sample 11 varied as may be seen from the illustration. The maximum dimension of the intermediate layer, however, was about 3 cm. Samples of the 3 layers of Stucco I were taken for analysis and designated as follows:

14a — Outer plaster.
14b — Gray intermediate layer.
14c — Core.

In separating the layers, it was observed that the gray, intermediate layer was extremely hard and strong. Its strength was such that core and plaster could be removed with a motor-driven wire brush and the surface ground on an emery wheel. The intermediate layer of Stucco II exhibited the same characteristics.

Sample No. 15. Plaster, covering the west side of the central wall of the arch of the Palace. The sample was readily pried from the brick wall with a knife blade and could be handled with little crumbling. It had a limey appearance and was quite hard. The surface of the sample, which was about 1 cm. thick, was covered with a very thin wash coat less than 0.5 mm. thick. The plaster contained little or no visible shell fragments or carbon particles. The sample for analysis contained no wash coat material.

Sample No. 16. Mortar, between the bricks on the west side of the central wall of the arch of the Palace. The mortar was more friable and softer than the plaster from the same area. It also had a limey appearance and contained appreciable quantities of shell. Large samples could not be obtained because of crumbling.

Laboratory Analyses

The analytical procedures employed were the same as those described in the previous paper, and the results are presented in the same manner. Identification of the acid insoluble material was omitted from this second set of samples. For purposes of brevity, the following legend is used: T = Temple IV, P = Palace.

Preparation of Samples for Physical Examination. The fragility of many samples of plasters, mortars, and any such materials, prevents their sectioning or smoothing for photographic

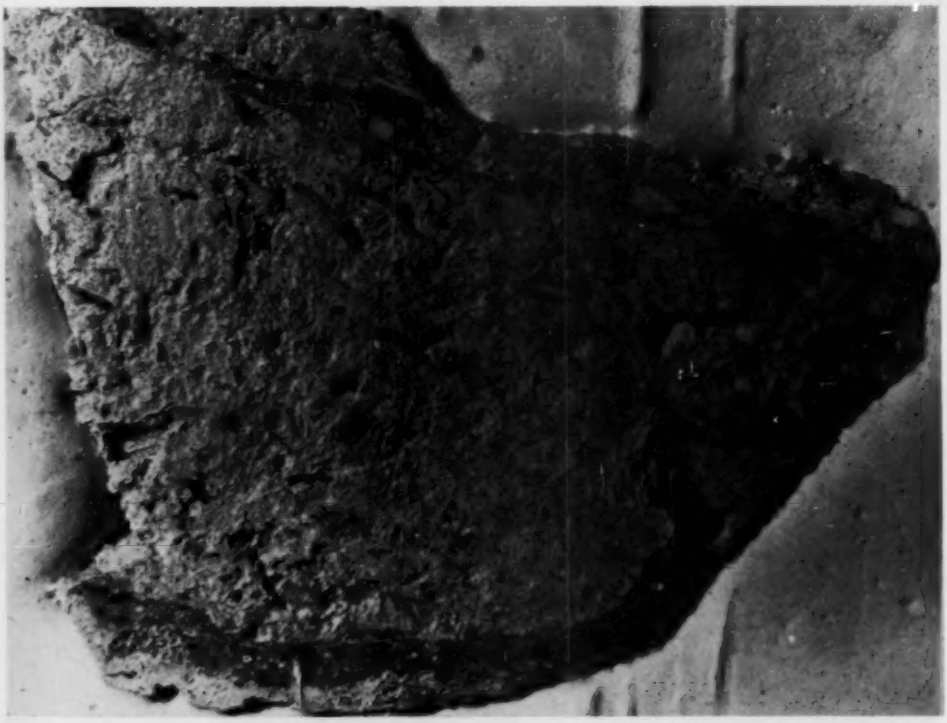

FIG. 1. Section of semicircular stucco showing outer plaster layer, hard gray intermediate layer, and core. Enlarged 3 times.

TABLE 1. ANALYTICAL RESULTS, TEMPLE IV AND PALACE, COMALCALCO.

Sample No.	Description	Insol. %	Ca %	Mg %	Ca/Mg Molar Ratio
11	T — Sanctuary — Plaster	10.0	33.8	0.64	31.6
12	T — Sancturay — Mortar	17.7	31.1	0.51	36.6
13	T — Sanctuary — Plaster (floor)	12.8	31.9	1.28	14.9
14a	T — Stucco	9.4	33.0	0.64	30.9
14b	T — Stucco	5.9	35.2	0.75	28.2
14c	T — Stucco	11.6	32.8	0.51	38.7
15	P — Plaster	4.7	35.5	0.38	56.2
16	P — Mortar	11.8	33.0	0.26	76.0

examination and seriously interferes with their handling. Physical stabilization without chemical reaction may be obtained by the following procedures. The thoroughly air-dried sample is completely immersed in a 1% solution of polystyrene in benzene and allowed to remain submerged until bubbles cease to rise, usually 5 to 10 minutes. At the end of this time, the sample is removed, drained, and dried in an oven at about 100°C. for about 30 minutes or until the odor of benzene is no longer evident. Upon cooling, the sample will be found to have retained its original appearance but can be sawn, filed, or even ground wet without disintegration. For the preparation of samples in the field, air-drying may be substituted for oven-dying. Maximum strength and minimum deviation from the original appearance are obtained, however, only with oven-drying, which may be accomplished at a later date without further impregnation. Care should be exercised during the above operations to avoid

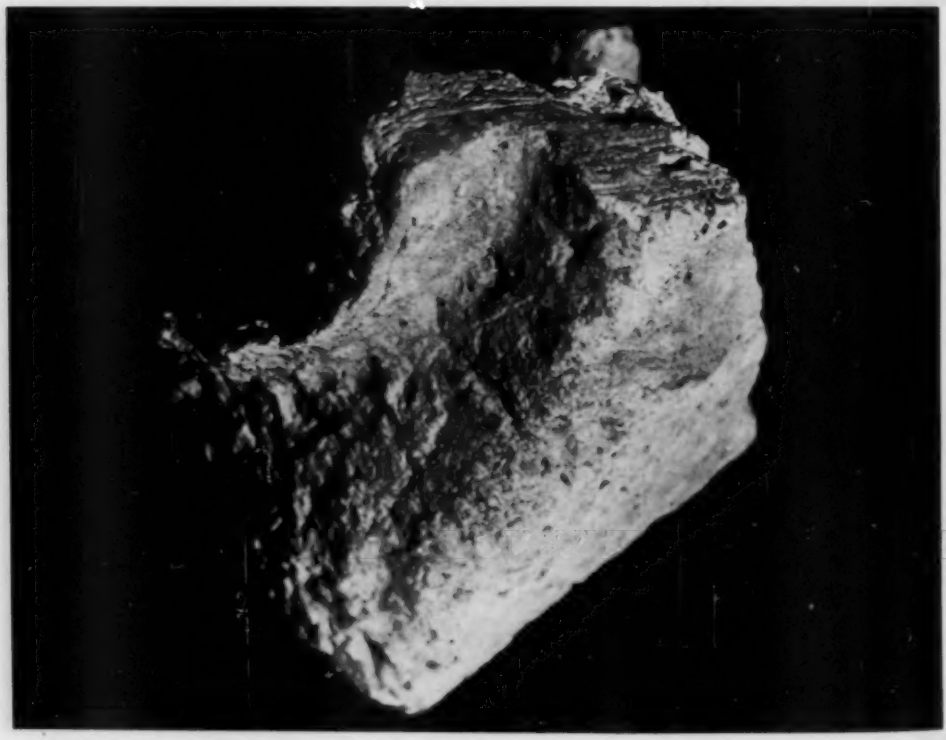

FIG. 2. Section of rectangular stucco showing L-shaped, hard, gray, intermediate layer at top. Actual size.

FIG. 3. Section of intermediate layer from semicircular stucco. Enlarged 40 times.

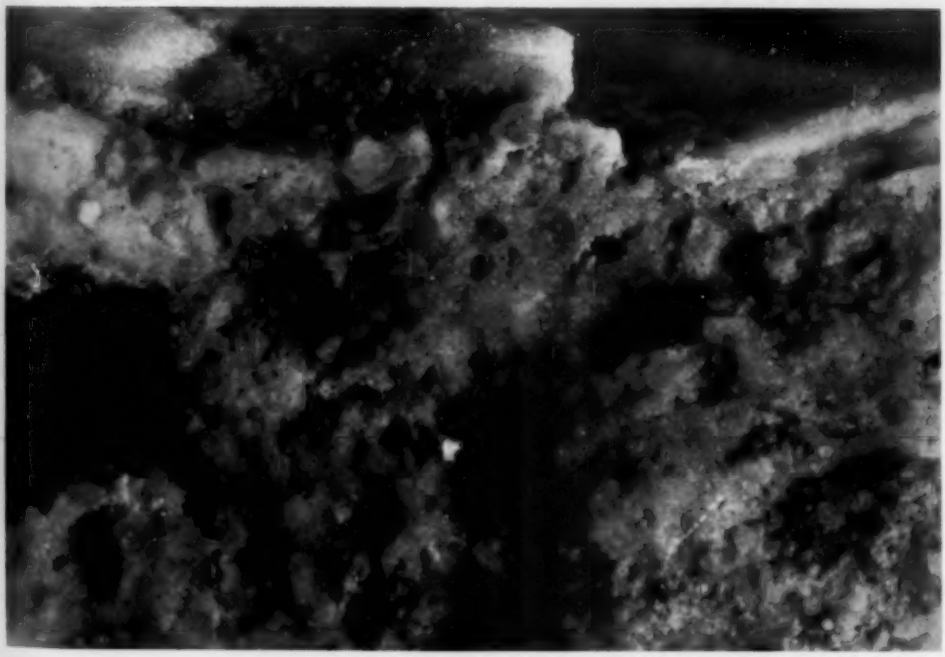

FIG. 4. Section of core from semicircular stucco. Enlarged 40 times.

TABLE 2. ANALYSES FOR CALCIUM AND MAGNESIUM — ACID-INSOLUBLE-FREE BASIS.

Sample No.	*Description*	*Ca %*	*Mg %*
11	T — Sanctuary — Plaster	37.6	0.70
12	T — Sanctuary — Mortar	37.8	0.62
13	T — Sanctuary — Plaster (floor)	36.6	1.47
14a	T — Stucco	36.4	0.70
14b	T — Stucco	37.4	0.80
14c	T — Stucco	37.1	0.58
15	P — Plaster	37.3	0.40
16	P — Mortar	37.4	0.29

inhalation of the benzene vapors. Impregnation and evaporation should also be carried out in an area devoid of free flames or heating elements which could ignite the flammable solvent vapors.

Impregnated samples may be freed of polystyrene by extraction with hot benzene in a Soxhlet or similar type of extractor. After evaporation of the solvent, the sample is ready for any chemical analyses, since the polystyrene is nonreactive and leaves no insoluble residue.

Discussion of Results. The high molar ratio of calcium to magnesium confirms the use of shell as a source of lime for the mortars, plasters, and stuccos during the brick as well as the prebrick period at Comalcalco. The absence of large quantities of acid-insoluble material in the samples of building elements of the brick period is indicative of the absence of a lime-aggregate type of construction and its abandonment as a method of building monolithic masses. The abrupt change in building techniques from the use of lime-aggregate to brick laid in mortar may have been the result of external influences from another cultural area or a long time interval between construction periods during which the art of making bricks was acquired.

The significance of the low acid-insoluble contents of the stucco Sample 14b (gray, intermediate layer) and the plaster Sample 15 (Palace wall) when compared with those of the other samples is not apparent, though there is the possibility that the shells from which the lime was made were near the top of a shell heap and had been cleaned by rain before burning.

The apparently unique 3-layer system used in the formation of the stuccos presents an interesting problem in techniques, since, from the chemical analyses, there appears to be no reason for the differences in the observed physical properties between the hard, gray intermediate layer and either the core or the outer plaster. It will be seen from Table 2 that the analyses on an acid-insoluble-free basis show no great differences between the 3 stucco layers nor between them and the other mortars and plasters.

It is evident from Table 2 that some factor other than the calcium, magnesium, or acid-insoluble content contributed to the strength and hardness of the gray, intermediate layer. A microscopic examination of the acid-insoluble residues from Samples 14b and 14c showed a much higher proportion of carbon and discrete silica particles in the intermediate layer than in the core. The major portion of the residue from 14c consisted of flocculated amorphous material, probably complex silicates. These observations suggest that the density and hardness of the intermediate layer was the result of a crystal growth different from that in the core or outer plaster, and that this difference could have been induced by the presence of a larger number of the necessary nuclei. It is highly improbable that recrystallization through the action of rain or seepage could account for the properties of the intermediate layer since such action would have been evident in the other 2 layers to at least some extent.

The possibility of nuclear-induced crystallization suggests the use of a grit different from that employed in the core or the addition of some material which altered the crystal growth during the curing of the intermediate layer. Whatever the cause, these differences are clearly demonstrated in Figures 3 and 4, which also show the marked differences in porosity. This phase of the problem is under further study.

The mortars and plasters from the sanctuary of Temple IV and those from the Palace show no unusual characteristics and are essentially alike in composition and not too different from comparable materials of the prebrick period with the exception that their composition is, perhaps, a little more uniform.

WESTFIELD, N.J.
February, 1957

SYMBOLS, GLYPHS, AND DIVINATORY ALMANACS FOR DISEASES IN THE MAYA DRESDEN AND MADRID CODICES

J. Eric S. Thompson

NO SATISFACTORY explanation, to the best of my knowledge, has been offered of the scenes on pages 16-20 of the Maya Dresden codex and the parallel passages on pages 93-95 of Codex Madrid which depict a goddess or woman in association with various birds, animals, and gods. She carries them on her head or shoulders or on a pack on her back supported by a strap across her chest.

Before attempting to solve the problem of the subject matter, I will make 3 postulates, for all of which, I believe, there is ample support. The first is that these 2 codices deal purely with divinatory matters; the second is that the woman depicted in these passages is Ixchel, the moon goddess, whose functions as patroness of childbirth, procreation, disease, weaving, and the growing crops I have previously defined (Thompson 1939; 1950: 230-1); the third is that the Dresden codex is the product of a Yucatec-speaking group.

Few or no persons would now deny the divinatory nature of the almanacs in these 2 codices or would contest the statement that most of them indicate the days which are favorable or unfavorable for such activities as agriculture, beekeeping, and hunting. Moreover, the astronomical sections of Codex Dresden must be regarded as divinatory, for the approach was astrological rather than astronomical; their main purpose was surely to give the priest fair warning when such dire events as heliacal risings of Venus and solar eclipses were to fall so that he could take the necessary steps to circumvent the evil consequences (Thompson 1950: 63-4).

The identity of the seated woman who appears in every picture of these supposedly medical almanacs is not, I believe, open to serious question. She is Ixchel, also called Zac Ixchel, "white Ixchel," the moon goddess and wife of the sun god. Sun and moon were the first parents, and the moon is commonly referred to as "our mother," "lady," and such terms. *Colel*, "mistress," also seems to have been applied to her. If, as seems possible, this term may be related to *col*, "milpa," we have an explanation of the fact that the curl of hair, the symbol of the moon goddess, is also the symbol of the earth sign, as for example, in the glyph Caban. Ixchel was the patroness of childbirth, sexual relations, disease, the earth and its crops, water, and the art of weaving. It is, therefore, logical to find her as patron in almanacs which supposedly deal with disease.

The main reasons for believing that Codex Dresden originated in northern Yucatán are these: The presence of Initial Series dating and the elaborate astronomical presentation strongly argue in favor of a lowland origin. The standard form of Calendar Round rules out Campeche and the Puuc, and I suspect, but cannot prove, that this also eliminates the Chontal region after the close of the Classic period. The rather marked Mexican influences in the codex argue against an origin in the center and the southeastern lowlands, regions which, in any case, were backward in Postclassic times. The readings of certain glyphs, for instance the drought, *kintunyabil*, glyph (Thompson, 1950: 269-70) seem to depend on the employment of Yucatec. The use of the numerical *ox*, "three," as an intensifier (Thompson, 1950: 268-9) eliminates the Palencano Chol region and probably the Chontal area as well. We are left only with northern Yucatán or conceivably Tayasal, but if Codex Dresden was sent as a present to the Emperor Charles V, as is not improbable, it could not have come from Tayasal.

The sets of day names used as yearbearers in Codex Madrid enable us to place its provenience as Campeche, the Puuc region of Yucatán, or possibly farther down the west coast. Draughtmanship and script are far inferior to those of Codex Dresden, but subject matter, apart from the astronomical and mathematical aspects of Dresden, is fairly close, as is the pantheon. The glyphs to be discussed seem to be absent from Classic texts, so there is no complication of reconstructing proto-Maya.

In interpreting passages in the Maya codices it is essential to bear in mind that the pictures supplement the hieroglyphic texts; the texts do not interpret the pictures. To illustrate this point, the almanac running across the bottom thirds of pages 42-45 of Codex Dresden indicates the dates which will bring drought and those which will bring good crops. The

drought glyph appears on page 42*c*, but there is no glyph to describe the subject matter of the accompanying picture in which the rain god is about to strike with his ax the young maize god who tries to protect his face with his hand. The same drought glyph appears on page 44*c*, but again there is no glyph to explain the accompanying scene, in which the same rain god, with torch in each hand, bestrides a deer with outstretched tongue which crouches on the ground apparently in the act of dying. Yet, the smiting of the young maize god by the rain god, who could send or deny rain, is an obvious convention for crop failure and its corollary, drought. *Cim cehil*, "death of the deer," is a stock Maya phrase for drought in the books of Chilam Balam (Roys 1933: 122), and the burning torch is a symbol of the scorched earth. It is, therefore, perfectly understandable that there should be no reference in the glyphic text to either deer or death. Instead, the glyphs for drought express the concrete fact pictorially represented by the metaphors of the dying deer and the stricken maize plant. Similarly, in one of the scenes accompanying the glyphs for good tidings and abundance the rain god paddles a canoe, a fairly obvious picture of good rains, but in the glyphic text there is no glyph for a canoe or paddle. This matter of the relation of pictures to text is important because so many attempts to read the Maya hieroglyphs have started with the incorrect assumption that the glyphs describe the pictures with which they are found. Moreover, glyphs occur without pictures; pictures never appear without glyphs.

Although divinatory almanacs for such activities as beekeeping, farming, weaving, and hunting have long been identified by the associated glyphs or by the accompanying pictures, yet the sending of disease, clearly one of the most important matters in which divine intervention affects man's fate, has not been recognized as the subject of any divinatory almanac.

The Maya do not, and presumably never did, hold the divine powers responsible for all disease which befalls mankind or his crops, but there is ample evidence that much disease was sent from above in the opinion of the Maya of Yucatán who, as noted, are probably to be credited with the painting of Codex Dresden and perhaps of Codex Madrid as well. Bishop Landa (Tozzer 1941: 106, 129, 184) tells us that the Yucatec Maya believed that death, sickness, and affliction were the results of wrongdoing and sin; that virulent pestilences, quarrels, or droughts were due to divine anger; and he adds that they performed rites for their gods solely that they might be granted health, life, and their daily bread. That sickness is divine punishment for wrongdoing or neglect of one's religious duties is still a Maya belief in Yucatán (Redfield and Villa 1934: 177; Villa 1945: 105, 134) and in other parts of the Maya area (Baer and Baer 1952: 248-9; La Farge and Byers 1931: 141-2). Furthermore, as will be brought out below, the Yucatec term *koch*, the glyph for which I believe I have identified, means both divine retribution and disease.

One might, therefore, reasonably expect to find in the Maya codices divinatory almanacs covering the subject of divinely sent disease. Pages 16-21 (Fig. 2) and 22*c*-23*c* of Codex Dresden and pages 93*a*-94*a*, 94*b*-95*b*, 94*c*-95*c*, and 91*d*-94*d* of Codex Madrid seem to meet this expectation, although perhaps only those scenes which show the goddess with bird, animal, or god on her head, shoulders, or back (Dresden: 16*b*-18*b*, 16*c*-20*c*; Madrid: 94*c*-95*c*, 93*d*-94*d*) treat to a varying degree of disease of man and crop. Consideration of the other sections will be postponed to some future study; Dresden pages 16*a*-17*a* will also be omitted from the discussion because the glyphs are largely destroyed.

In almost all divinatory almanacs day signs are at the left, and the additions needed to reach each set of days which govern each divination are given in black bars and dots (Fig. 2). To simplify handling of this involved subject, the accompanying days are omitted from the present discussion, except in the example of interpretation given below, but it must be emphasized that whatever fate a passage promises — drought or abundance, death or good tidings — the days with which that fate is associated are always given. Indeed, on the specific days depends the whole divinatory structure.

A divinatory almanac is composed of several compartments or subdivisions, occasionally only two, but normally four or five, depending on the way in which the 260-day almanac is divided. Normally, each compartment has 4 (sometimes 6) glyphs at the top, and below them the arithmetical computation in bars and dots to allow the priest to calculate the days to which the divination applies. Below these is the picture which illustrates, comments, or amplifies the glyphic text (Fig. 2). Ideally,

FIG. 1. Examples of spiral glyph. *a, c, d, f, g, m, n, r,* Codex Dresden, pp. 46, 18*b*, 17*b*, 17*c*, 49, 18*c*, 4*c*, 39*c*, *b, e, h-l, o,* Codex Madrid, pp. 87*b*, 95*c*, 22*c*, 17*a*, 99*c*, 83*b*, 73*b*, 64*b*; *p, q,* Codex Paris, pp. 10, 6.

every section of an almanac has its accompanying picture, but if there was no change in the general subject the picture in one or more sections was sometimes omitted to save space. The glyphic text, however, is always present, and when the picture is omitted, the repetition of the action glyph indicates that the general subject is the same, although the subject glyph, the *nomen actoris*, can change. For example, on Dresden 17*b* there are no pictures with Compartments 2 and 3 (Fig. 2 *b*, top right corner). However, the glyphs for monkey and dog at the head of their respective columns, each followed by the same action glyph, indicate that those animals are engaged in the same activity as is depicted in Compartment 1.

The first 3 glyphs in a compartment usually comprise the glyph of the deity who rules over the days assigned to the division or compartment, an action glyph or verbal-noun (verbs are weak in Yucatec), and the object of the action. The last glyph is the augural glyph which gives the result, beneficial or otherwise, of the deity's action on mankind. The order of the first 3 glyphs can vary. For example, the 4 glyphs above the picture of the moon goddess carrying on her back the manikin-like death god (Fig. 2 *b*, lower right) read: "The death god (1) her burden (2) the goddess Ixchel (3) death [the augury] (4)." In better English: "The burden of the moon goddess is the god of death. Death is the augury." In Maya the glyphs probably read: *Yum Cimil* [the death god] (1) *u cuch haab* (2) *Ixcolel* [Our Mistress, the moon goddess] (3) *multun tzek* (4). However, the Maya word for burden, *cuch*, means much more than merely the load one carries on one's back; it is a metaphor for the outlook for the future, the destiny in store for the community or the individual. The Motul dictionary somewhat pessimistically defines *cuch haab* (*haab* is year) as "the labors, hunger, and pestilences which occur in this life." *Cuch* also signifies the duties and responsibilities associated with office or an administrative post, and corresponds closely to our "burdens of office." The transcendental importance of this conception and its well-established glyph are discussed elsewhere (Thompson 1950: 59-61, 267).

We are now in a position to restate the meaning of the glyphs which stand above this picture of the moon goddess carrying on her back the death god, bearing in mind that Ixchel, the moon goddess, is a deity of disease: "On the days Cimi, Etz'nab, Oc, Ik, and Ix the death god is the fate the goddess has in store for us. Much death is the augury." The day names are not written, but the associated numbers showed the Maya priest, as well as the modern decipherer, which days are intended.

In the left compartment of Dresden page 18*b* (Fig. 2 *c*, top left) the moon goddess is again seated, but she carries the death god not on her back, but perched on her shoulders. The glyphs above the picture are the same as those just discussed except that a spiral glyph with *u* prefix and *ti* postfix (Fig. 1 *c-e*) replaces the *u cuch haab* glyph. As the primary meaning of *cuch* is a load carried on one's back, the replacement of this glyph by the spiral compound might well reflect the change of position of the death god from resting on the back load support to crouching on the goddess' shoulders. However, just as the *cuch* depicted on the goddess' back stands for the metaphorical derivative *cuch*, "fate," which she decrees for mankind, so the action of the death god in perching on the goddess' shoulders should have a secondary meaning or possess a homonym which gives the key to the passage. Such a word is the Yucatec *koch*.

FIG. 2. Lower two-thirds (*b* and *c*) of Codex Dresden pp. 16-19. Read left to right across upper halves of pages and the same for lower halves. Vertical colums of 5 day signs mark starting points of almanacs. Bars and dots carry count forward, and each compartment has 4 hieroglyphs. *Cuch* almanacs run: from *a* top center to *b* top center; from *b* lower right to *c* lower center; from *c* lower center to *d* lower center; from *d* lower center to p. 20 (not shown). *Koch* almanacs run: from *b* top center to *c* top right; from *a* lower left to *b* lower center.

The Motul dictionary gives as a meaning of *koch*, to carry above one on one's shoulders a cross, wood, or such like things. *Kochcal* (*cal* is neck or throat) has the same meaning, and *kochhol* (*hol* is head) is to carry on one's head; *kochche* is to carry something, such as a litter, by means of a pole (*che*) resting on the shoulder, and *koch pixan* is the load of one's conscience (*pixan*, soul). The Pio Perez dictionary gives the translation to carry on one's shoulders and also lists *kochol*, the load one can carry on the head and *kochcaltah*, to carry on the shoulders. *Koch* also appears in both dictionaries with the meaning to attack with horns (*cornear*), a use which in pre-Columbian times must have been largely confined to describing the fights of deer. *Koch* is also the gullet.

Koch also means divine punishment. For this homonym the Yucatec Motul dictionary gives the meanings fault, offense, guilt (*culpa*) and illness which results from wrongdoing. The sense of chastisement appears in the expression given in the Motul dictionary *dz'a koch*, "punish and chastise with penalty." The divine origin of this is brought out in the example which reads "God now chastises us." Literally the phrase means to give (*dz'a*) punishment (*koch*). According to the Motul dictionary, *koch* is a term applied also to diseases of the maize crop, presumably as a result of divine intervention, although that is not stated. The San Francisco similarly translates *koch* as fault, punishment, or sickness, and the example reads "God has given me sickness." The Pio Perez dictionary gives for *koch* and *kochil*, guilt, sin, error, obligation, responsibility, but the meanings punishment or sickness are listed as no longer in use. Indeed, Pio Perez, as Ralph Roys has noted, translated *koch*, where it appeared in the annual calendar of the Chilam Balam of Mani which he presented to Stephens, as a day of service and even as taxation, but that was after 1840, by which time many of the old Maya ritualistic terms had fallen into desuetude. *Koch*, as dire fate in store, appears in the prophecies for katuns 11 Ahau, 5 Ahau, and 8 Ahau, in contexts of violent death. Roys (1954: 37, 39, 42) translates the term as punishment for guilt.

I suggest that in the passage under discussion *koch*, represented pictorially by the carrying of the death god on the goddess' shoulders, is to be read rebus fashion as *koch*, divinely inflicted sickness or punishment, supplying a close parallel to *cuch*, pictured as a burden carried on the back, but to be read in its metaphorical sense as the fate in store for mankind. This juxtaposing of passages with *koch* and *cuch*, with semblances in meaning and sound is just what the Maya, with their love of play on words, strove for in their writings (Roys 1933: 70-4, footnotes; Thompson 1950:62).

With the translation of the spiral glyph as *koch*, and its affixes as "his" and "to," meanings long since applied to them (Thompson 1950: 50, 188), the 4 glyphs of the passage (Fig. 2 *c*, top left) would read: *Yum Cimil* (1) *u koch ti* (2) *Zac Ix Colel* (3) *Multun Tzek* (4), literally "Yum Cimil, the death god, his carried on the shoulders of Lady White Mistress. Heaped up death," but rebus fashion it reads "On the days Eb, Kan, Cib, Lamat, and Ahau the death god is the divine punishment the white goddess has in store for us. Much death is the augury." The passage is almost the same as that with the *cuch* glyph, merely a second way of expressing the same thing.

Before discussing other passages in which sundry creatures are perched on the moon goddess' shoulders below texts with our spiral glyph, let us test the meaning of divine punishment or sickness tentatively assigned it.

Altogether the main element, with its varying affixes (Fig. 1 *a-r*) appears some 85 times in the Maya codices, principally in Codex Madrid, less commonly in Codex Dresden, and very rarely in Codex Paris. This is Glyph 345 in the Gates (1931: 157-9) numeration and Glyph 1310 in the Zimmermann (1956: 84-5) system. A very similar glyph (Gates's number 353; Zimmermann's 1311) has the hook or spiral solid black. Previously I confused these 2 glyphs, and identifying the latter as an aquatic symbol, supposed that the former had the same value (Thompson 1950: 114); the two should not be confused.

Apart from the use of the glyph with scenes such as have been discussed, the most important use of the spiral glyph, the supposed *koch* sign, is as an augural glyph, that is to say a glyph, usually the last of the group, which records the influence of the ruling deity on the date in question, the luck of the day (Thompson 1950: 268). As an augural glyph in Codex Madrid it is always combined with the comb affix (Fig. 1 *h-l*), and it usually appears with glyphic or pictorial representations of the death god or the related god of misfortune and prob-

ably of human sacrifice, God Q (Thompson 1950: 131-2). Of the 44 examples in Codex Madrid, thirty-five are in short texts which include the glyph of one or the other of those 2 malignant deities, and the glyph for death is usually also present, but in none of these passages does the glyph for evil or misery, the *kas* glyph (Thompson 1950: 258), appear, although that glyph generally accompanies the death god and God Q. Clearly our spiral glyph is malignant in this compound and serves as an alternative to the *kas* glyph. The suggested interpretation of *koch*, disease as divine punishment, fits very neatly these passages in which the death god and the malignant God Q are in charge, and in which the death glyph also appears with frequency. Its substitution for the misery (*kas*) glyph is understandable for the two are nearly synonymous.

The spiral glyph with *u*-bracket prefix and comb postfix (Fig. 1 *g*) appears 9 times in Codex Dresden, in all cases in connection with the planet Venus. One appearance is in the introductory section on page 24 of Codex Dresden; the other 8 occurrences are in the texts adjoining the pictures on pages 46, 48, 49, and 50 of the same codex which illustrate the punishment the god of the planet inflicts on various categories of human being and of nature.

Seler (1904: 384-7) in a piece of brilliant research brought to light material on Mexican ideas concerning heliacal rising of Venus and showed that the pictures on pages 46-50 of Codex Dresden illustrated the same beliefs. In Mexican thinking the Venus god was particularly malignant at heliacal rising. Sahagun (1938, Bk. 7, Ch. 3) tells us that the light of the newly risen planet was unlucky and was believed to bring sickness. According to the Aztec text (Sahagun, 1950, Bk. 7, Ch. 3): "And when it newly emerged, much fear came over them; all were frightened. Everywhere the outlets and openings [of houses] were closed up. It was said that perchance [the light] might bring a cause of sickness, something evil, when it came to emerge. But sometimes it was regarded as benevolent."

Seler quoted a passage from Codex Chimalpopoca which expresses the effects of the malignant rays of light at heliacal rising as the spearing of the victim by the planet, and which names the various categories of victims, such as youths, chiefs, old people, the maize crop, and the rain. He demonstrated that this spearing of victims by the Venus god is illustrated not only in Mexican codices, but also in the pictures in Codex Dresden which accompany the Venus tables.

It is logical that the spiral glyph should occur with these pictures of the sickness and evil caused by Venus at heliacal rising if the suggested interpretation of the glyph as *koch*, sickness or divine punishment, is correct. Moreover, in these texts treating of heliacal rising it appears to supplement or alternate with the evil (*kas*) glyph, which it is natural to find in these passages, as well as with a remarkable variant of the moon glyph found only in these passages of the Venus pages (very hesitatingly I suggest the phonic value *kalaan*, "shut up," for the moon stands for the number 20, *kal* in Yucatec). These 3 glyphs are principally in Glyph Blocks E7, E9, and E11, as well as in the shorter F groups of glyphs. Only on page 47 is the *koch* glyph absent. Barthel (1955) recognizes in these pages yet another glyph for the misfortunes Venus inflicts on humanity at heliacal rising.

In connection with the use of the supposed *koch* glyph to indicate the sickness sent sundry categories of mankind by Venus at heliacal rising, it is of interest to note that in the almanacs grafted on the Christian year in the books of Chilam Balam *koch* is given as the fate of priests on the day 12 Chuen, of nobles on the day 5 Caban, of the *ah kulel* officials on the day 11 Akbal, and of nobles again on 12 Kan, and the *koch* of the young men is brought to an end on the day 1 Manik. These dates are respectively 11, 17, 22, and 23 days after, and 13 days before, 1 Ahau, the great day of Venus at heliacal rising and the day name of the planet. I do not believe that this is coincidence, but that in these entries of the 18th century we have a confused tradition of the *koch* inflicted on those categories of mankind by the god 1 Ahau, Venus, at heliacal rising. At least, nobles and youths are among the groups listed in the Codex Chimalpopoca as threatened by the rising planet.

Once the *koch* glyph has a "knot" postfix (Dresden 18c; Figs. 1 *m*; 2 *c*, lower center), and refers to the little misery manikin which the goddess carries on her back. On Dresden 19c (Fig. 2 *d*, lower center) the glyph of God Q stands in the same position above an exactly similar representation of the goddess carrying the misery manikin. It is reasonable to suppose

that the *koch* glyph here denotes the personification of divine retribution, although, so far as I know, no word for a sender of punishment has survived.

Once the *koch* glyph has the ax prefix (Madrid 73*b*; Fig. 1 *d*). In the accompanying scene God B, the rain god, is seated in what may be a cenote and holds what may be a bean or some other seed, and an awl. Opposite is a Muan bird. Although this scene is not readily explained, the accompanying glyphs include that of the death god and the death sign so again the *koch* sign probably refers to divine punishment.

We have now accounted for most of the appearances of the *koch* glyph, and have found that they can be satisfactorily assigned the meaning *koch*. There remain a few examples where the interpretation is more obscure.

One *koch* compound (Fig. 1 *n*) appears 4 times in an almanac on Dresden 4*c*-5*c* above as many pictures of gods holding the same *koch* glyph. The subject of the almanac is not obvious. Among the meanings of *koch* is that of something true or which turns out to be true, infallible, and certain. The Motul dictionary cites as an example *koch uayak*, a dream which turns out to be true, suggestive of a prophetic meaning for the word, and that might be the meaning in this almanac, but I hesitate seriously to advocate it.

In the divinatory almanac of Madrid 97*c*-98*c* the *koch glyph* with comb affixes (Fig. 1 *j*) appears in three or four of the 5 compartments. The associated pictures show gods holding germinating plants which rise from seeds (?) labeled with the *Ik*, "life," sign. As *koch* is also applied to diseases of crops, this is a possible explanation of the occurrences here, but I am not satisfied that that is the correct interpretation. Possibly *koch* was a somewhat general term for a certain class of medicinal plants, including *Ricinus communis* believed to be of European introduction. Roys (1931: 255, 256) discusses *xkoch*, *koch*, *xkochle*, and *kaxilixkoch*, all medicinal plants. Once the spiral element serves as the glyph for the month Muan (Fig. 1 *a*), and for that I can offer no reasonable explanation.

There are, accordingly, a few isolated examples of the spiral glyph where the interpretation is uncertain, but I think I have demonstrated that the Yucatec root *koch* satisfactorily translates most of the occurrences. With greater confidence, therefore, we can return to a fuller investigation of the *koch-ti* compound and the *cuch* which the goddess carries in those almanacs which, it is suggested, treat largely of disease.

In the 5 compartments of the divinatory almanac on Dresden 19*c*-20*c* the seated moon goddess carries on her back in sequence: the personified figure of the misery (*kas*) glyph (Fig. 2 *d*, lower center); the fire symbol with flames rising from it (Fig. 2 *d*, lower right); a second representation of the misery (*kas*) glyph; the young maize god; and, lastly, a youthful deity, perhaps the ambiguous God H. The figures are about half the size of the goddess. The 4 glyphs in each compartment read as in Table 1.

The white prefix makes no difference to the identity of the goddess. She is the same moon goddess, Ixchel or Colel, "mistress" (perhaps denoted by the earth curl, like a query mark before her face — *col* is milpa). The destinies she has in store for mankind are both good and bad; she brings good crops on some days; on others death is the destiny she imposes on mankind.

The burning fire on her back and the *kak*, "fire," glyph which it illustrates do not fit the context if taken literally. However, *kak* means not only "fire"; it is also the Maya name for a number of eruptive skin diseases. Roys (1931: 138-94) lists the names of no less than 33 skin diseases, including smallpox (post-Columbian?), which contain the term *kak*. In view of the texts previously cited which had to be read, not literally, but metaphorically, we can be certain that this passage does not tell us that the moon goddess is carrying a lighted fire on

TABLE 1. READING OF GLYPHS IN DRESDEN 19c-20c (see text for explanation).

God Q	her destiny (*cuch*)	the white goddess	*tok-te*-unknown
Fire (*kak*)	the white goddess	the end of her destiny	flame-*te-haab*
The death god	her destiny (*cuch*)	the white goddess	death (*multun tzek*)
The maize god	her destiny (*cuch*)	the white goddess	abundance of maize.
The white lord	her destiny (*cuch*)	the white goddess	good tidings

her back, but that eruptive skin diseases are the fate she has in store for mankind on the days in question. The lady's not for burning.

In examining the little misery manikin, we are reminded that the Yucatec word *yaah* means sprite or imp (*duende de la casa*) and also disease in general, dangerous sores, poison, and venom.

It is also worthy of note that the augural glyph in the first compartment has the flint sign (*tok*) prefixed to it, and God Q whose glyph is the first in this compartment is the malevolent god of the flint knife (Thompson 1950: 132). *Tok* enters into the names of 2 Maya diseases: *u lom tokil hubnak*, diarrhea which stabs like a flint knife, and *akab tok*, "dark flint," a skin disease. *Tok* is also the term for remedial bleeding (Roys 1931: 52, 53, 136, 137). Nevertheless, the flint prefix here may have a derived meaning, for the knife was clearly regarded as something which bit into the flesh, and in some Maya languages the term for mouth is incorporated in the name for knife (Thompson 1950: 87). *Chibal*, the Yucatec term for bite or sting, is also used for aches and pains, such as headache, aching bones, abdominal pains, and earache, and it may well be that the flint prefix in this text is to be used in that sense.

In 2 other almanacs, occupying Dresden 17*c*-19*c* (Fig. 2 *b*, lower right, to *d*, lower left) the moon goddess is again shown with her burdens and the *cuch* glyph stands above in each compartment. The burdens comprise respectively: the death manikin; the *yax-kan* compound of unknown meaning; the misery manikin with death attributes; a skull in a kind of bag; and, again the *yax-kan* compound.

Of major interest here are the glyphs above the scene showing the goddess carrying the kind of skull in a bag (Fig. 2 *c*, lower right). The first of these, representing the destiny of the goddess is the death symbol (*cimil*) with the affixes *chac*, "red" or "great," and *zac*, "white" or "pseudo." *Zac cimil*, "pseudo death," is a common Maya term for fainting spells. According to the Motul and Vienna dictionaries the term also means *gota coral*, "epileptic fits," and the Vienna dictionary adds *mal de corazon*, which in the context can only be taken as heart attacks. Logically, the addition of affix *chac* would indicate a severe attack. The word *chac* is used with other diseases, notably with *hoch ka*, "perforating ulcers," *muclah kak*, "swelling and eruption," and *dz-unuz*, "cancer," where it seems to carry the idea of "severe" rather than "red." It is worth noting that I advanced this interpretation of the *chac zac cimil* glyph several years ago when I had no thought that this could be an almanac treating largely of disease (Thompson 1950: 191).

On Dresden 18*c* (Fig. 2 *c*, lower center) the glyph corresponding to the misery manikin with death attributes is the *koch* sign with knot (?) postfix, which presumably should be read as divinely sent disease in general (Fig. 1 *m*).

In brief, then, the pictures of the moon goddess with diverse burdens on her back and the glyphs they accompany tell us that the fate (*cuch*) the goddess has in store for mankind on specified days (to simplify the presentation I do not cite the positions in the various almanacs, but they are given) are death, misery, the *yax-kan* compound of unknown meaning, plentiful maize, rain, God D, Itzamna (good crops?), various eruptive diseases of the skin, heart attacks and epilepsy, and general punishment or disease sent from on high.

The glyphs of the birds, animals, and gods which appear in the almanacs with the *koch-ti* (perched on shoulders or head) glyph on Dresden 16*c*-17*c* (Fig. 2 *a*, lower to *b* lower center) and 17*b*-18*b* (Fig. 2 *b*, top center, to *c*, top right) are as follows: The Yucatecan screech owl, *ah coo ti akab* or Muan; quetzal, *kuk*; macaw, *mo*; black vulture, *ch'om*; black vulture, *kuch*; turkey, *ah tzo*; and, on 17*b*-18*b*, *ch'om*, vulture, again; monkey, *maax*; dog, *pek*; death manikin; God D; and the Yucatecan screech owl, *ah coo ti akab* or Muan.

Of the birds and animals listed above several are the names of skin diseases or of kinds of fits or madness. *Ah coo ti akab* means the one who is mad at night and *ah co tancaz*, "mad frenzy," is an important disease in the Ritual of the Bacabs. *Mo* is the generic term for macaw; *mo tancaz* or *balam mo tancaz*, "macaw madness" or "jaguar macaw madness," and *tzitz mo ik*, "spotted macaw spasm," are important diseases in the Ritual of the Bacabs. *Kuch* signifies not only vulture, but also scabies, remedies for which are published by Roys (1931: 158). I follow Tozzer and Allen (1910: 331) in identifying the bird on Dresden 17*b* as the zopilote or black vulture, *ch'om*. *Ch'om ch'om* is the term used for the pittings of the skin left by diseases such as smallpox. *Pek* is the generic term for dog, and is also the name for

more than one type of spotty infection of the skin (Roys 1931: 166). *Ah tzo* is the term for the male ocellated turkey, and *ah tzo* or *tzo* is also a term for pimples on the face. (The turkey is not shown in this text, but his glyph stands above the turkey caught in a trap on Codex Madrid, p. 91*a*). *Maax* signifies both spider monkey and an inflammation of the gums called in Maya *chac nich' maax*, "red gum monkey" or "monkey chile" (Roys 1931: 184). It will be noted that all the diseases listed are skin diseases or forms of frenzy or madness. Among the *mo* frenzies is *auat mo*, "crying out macaw," listed in the Motul dictionary as a violent paroxysm of shrieking, usually ending in death.

Finally, we have the picture of the quetzal bird, the Maya name for which, as Roys (1933: 121) has shown, was *kuk*, with *yaxum*, "green bird," as a more generalized term. *Kuk* also means shoot or sprout, and, metaphorically, children. The glyphs in this compartment with the picture of the quetzal bird perched on the goddess' shoulders is different from the remainder. In this section alone the *koch* glyph is not shown, and, in contrast to the ill-fortune of most of the sections in these divinatory almanacs, the augural *ox-oc*, "good tidings," glyph is given. Here then the news is excellent and no *koch* is to be inflicted on mankind. Perhaps it is not farfetched to suppose that here the goddess is giving children, "little sprouts," to mankind. This is not unreasonable for Ixchel is above all things a patroness of childbirth. Parenthetically, the use of *kuk* for child perhaps derives from the precious nature of the quetzal. In Nahuatl a midwife spoke of the child about to be born as "jade" or "quetzal feather," and the same terms were used by a father of his son on ceremonial occasions, for instance when he arranged his entrance at the calmecac (Sahagun 1938, Bk. 3, app. Ch. 7; Bk. 6, Ch. 27).

The second glyph in this compartment (Fig. 2 *a*, lower center) is the *kaz*, "evil" or "misery" glyph, and this is the only passage in Codex Dresden where it is not an augural glyph. The Motul and Pio Perez dictionaries list *kazil* and *kazal* as the male and female sex organs and as semen. In view of the suggested translation of *kuk* as "children," and taking into consideration the moon goddess' close connection with the sexual act, it seems logical to translate the *kaz* glyph in this passage as generative powers. The whole passage would then read: "children from the generative powers of the goddess. Very good tidings." It may be no more than chance that the first day sign associated with this compartment is Oc, which has definite associations with the sexual act (Thompson 1950: 79).

In identifying the glyph of the turkey as *ah tzo*, I have assumed that the male turkey is intended. At least, the bird on Madrid 91*a* over which this glyph stands is surely a male. *Ah tzo* is the normal name for the turkey cock, both the wild ocellated and the tame turkey. It is used in the ritual of the chiefs in the Chilam Balam of Chumayel (pp. 39, 40, 69, 70). The term *cutz* apparently was once confined to the female ocellated turkey, for it is translated as female in the Motul and Ticul dictionaries, and is used to denote a hen bird, in contrast to the masculine *ah tzo*, in the last passage cited from the Chilam Balam of Chumayel. However, in the Vienna and the Pio Perez dictionaries the term *cutz* is applied to both male and female turkeys, suggesting carelessness or a widening of the term in later colonial times. For dog, I use *pek*, the everyday Yucatecan term.

Almanacs on Codex Madrid 93*d*-94*d* and 94*c*-95*c* closely parallel those of Codex Dresden just discussed. In the former the *cuch* glyph again appears above pictures in which the same goddess carries sundry deities on her back; in the latter the supposed *koch* glyph replaces the *cuch* glyph and birds are perched on the goddess' head in all 8 sections. Because of the much cruder draughtmanship in Codex Madrid, reliable identifications of the birds are harder to make, and the glyph sequence is more complex. Accordingly, I shall not discuss these sections in detail. Clearly, the subject matter and approach is along the same lines as those of the parallel passages in Codex Dresden, and on the interpretation of those the whole thesis will stand or fall.

When the identifications of the various diseases were first made I was discouraged by the fact that several of the names were not of dangerous and widely diverse diseases, but were of skin ailments of somewhat minor importance and all very much of a sameness. A review of the problem of diseases and its senders proved an effective medication.

Among the peoples of Central Mexico the belief was widespread that specific related dis-

eases were under the control of certain deities. Thus, skin diseases such as varieties of pox, pustules and eruptions, scab, and infections of the eyes were sent by Xipe Totec, and those suffering from such diseases could be cured by donning the flayed skins of the god's impersonators. Ome Acatl, god of banquets, an aspect of the all-powerful Tezcatlipoca, sent throat diseases, pressings on the chest (indigestion?), and caused blockages of the gullet with food, whereas the gods Amimitl and Atlaua, who hailed from the region of Xochimilco, sent dysentery and diarrhea, and coughs, catarrh, and consumption. Atlatonan was the goddess of lepers and those with groin tumors, and the Tlalocs had in their care all those who suffered from dropsy, leprosy, gout, and mange. Sufferers from those diseases, as well as those who drowned or were killed by lightning went to Tlalocan, the paradise of the Tlalocs. The goddess Tzapotlatena, discoverer of the medicinal turpentine called *uxitl*, cured a number of skin diseases of the scalp, face, and lips. The goddess Tlazolteotl, the Mexican equivalent of Ixchel, also sent diseases to mankind, but these are not specified. Still other deities sent other ills.

Clearly, for central Mexico certain categories of diseases were controlled by certain gods. Information from the Maya area is much sparser.

Ruth Bunzel (1952: 144, 145, 267, 292) notes that in Quiché-Maya belief sickness results from sin, but may be sent from God or by one's ancestors or by the *idolos* or may result from black magic, but generally speaking — and such contradictions are not unnatural — all sickness, serious or trivial, is sent by the "Lord of Sickness and pain and his cohorts, the gods of special sicknesses, poisoning, alcoholism, and all forms of violent death, and physical torture." Accordingly, among this important Maya group special gods control special diseases and quite possibly groups of related diseases.

Our best source for the ideas of the lowland Maya on this matter will eventually prove to be *The Ritual of the Bacabs*, which contains 46 medical incantations, but these are extremely recondite and largely untranslated. Diseases are certainly linked to deities, but invocations embrace so many deities that it is difficult to establish specific associations. According to one incantation the sun god sends burns for "The great circle of the sun in the sky is its [the burn's] father" (Roys translation).

Landa (Tozzer 1941: 154-5) lists Ixchel, Itzamna, Cit Bolon Tun, and Ahau Chamahes as deities of medicine, but he does not say whether they merely cured diseases or whether they also sent them. In view of the evidence from central Mexico cited above and the information from the Quiché and hints in the Ritual of the Bacabs, we may conclude that it is highly probable that the pre-Columbia Maya of Yucatán believed that disease was controlled by a number of distinct deities, each one of whom had in his power one or more groups of related diseases.

Clearly, the discovery that the *koch* sent by Ixchel is restricted to certain fits and a single group of related skin diseases is in complete accord with the pre-Columbian pattern of belief concerning disease which the above study has made patent, and that encourages the belief that these passages are correctly deciphered.

I have no desire to enter into polemics on methods of interpreting the Maya codices, but in fairness to the reader it should be noted that some of the glyphs here discussed have been read quite differently by a recent interpreter of the Maya hieroglyphs.

Summary

In view of the divinatory nature of the Maya codices, one may logically conclude that among the almanacs which treat of divine intervention in the affairs of man there should be some covering days connected with disease which were believed, at least in part, to have been sent by various deities as punishment for wrongdoing.

A single glyph, the main element of which is a spiral, seems to represent the term *koch*, "divinely sent sickness or punishment." The 3 main uses of this glyph are:

(1) As an augural glyph, that is a glyph which indicates the good or bad luck of the day resulting from the action of the god in charge. As an augury, this supposed *koch* glyph occurs almost invariably in passages recording that the death god or God Q, an ill-omened deity of violence, was in control. It usually replaces the *kas*, "evil" or "misery" glyph as the augury of the day.

(2) The glyph appears, together with the *kas*, "evil," glyph in texts dealing with the heliacal rising of Venus, when, as early sources state and as the associated pictures on these

pages declare, the planet was believed to inflict sickness and death on certain categories of mankind, as well as on the crops. Here the interpretation *koch*, "divine punishment or sickness," fits perfectly.

(3) The *koch* glyph appears in almanacs in which the moon goddess, patroness of diseases, of human generation and birth, and also of the crops and weaving, has birds or animals on her head or shoulders, but from the adjacent almanacs it is clear that this action of having various types of fauna on her head or shoulders corresponds to the *koch* glyph (Fig. 2 *a*, *b*). It is suggested that here *koch*, which also means to carry on one's head or shoulders, is to be read rebus fashion. The birds and animals represent certain diseases which are the divine punishment (*koch*) the goddess sends, but that idea is expressed pictorially by showing the birds and animals carried on her head or shoulders (*koch*). These birds and animals are also the names of a series of skin diseases and certain kinds of fits.

Kuch, ch'om, pek, maax, moo, ah tzo are not only vulture, king vulture, dog, spider monkey, macaw, and ocellated turkey cock, they are also the names of diseases. Similarly, in an adjacent almanac the goddess carries on her back the symbol for fire (Fig. 2 *d*, lower right), the Maya word for which is *kak*. *Kak*, however, also signifies skin eruptions such as smallpox, and as the glyphs above inform us that *kak* is the destiny the moon goddess has for mankind on that day, it is virtually certain that *kak* should here be read as skin disease.

The fact that the diseases fall into 2 categories only, skin diseases and fits, is significant. Data, particularly from the allied cultures of central Mexico, indicate that in pre-Columbian times certain categories of diseases were controlled by one deity, others by another; a single god or goddess would not have associations with a series of unrelated diseases.

The moon goddess was patroness of other activities in addition to disease, and such associations appear to be partly indicated in these almanacs. In one compartment the goddess, who is also a patroness of generation and of childbirth, has on her shoulders a quetzal, *kuk*, but in this compartment the *koch* glyph is absent, its place being taken by the *kaz* glyph, and the augural glyph is of very good tidings (Fig. 2 *a*, bottom center). *Kuk* is an allegorical term for children, and *kazil* can mean semen. This compartment therefore would indicate that the goddess' influence is favorable for generation.

There appears to be good evidence that these almanacs do treat, in part, of divinely sent disease, and that a general glyph for this as well as glyphs for particular diseases and illnesses have been identified. The material reinforces the deduction previously made that the pictures supplement the glyphs, not the reverse, and that they must often be read rebus fashion, as, for instance, where the birds are carried by the goddess on her head or shoulders, this is to be read as *koch*, divine punishment. Similarly the quetzal bird is to be read as *kuk*, burgeoning and, allegorically, children.

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CARNEGIE INSTITUTION OF WASHINGTON
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FACTS AND COMMENTS

THE SIGNIFICANCE OF DIFFERENCES BETWEEN RADIOCARBON DATES

Presumably all archaeologists know that radiocarbon dates are estimates of true dates, or, more precisely, that they are derived from estimates of the true rate of emission of electrons from radioactive carbon. If it were possible to keep each specimen in the counter for an indefinitely long period or if the emissions occurred with the regularity of clock ticks, there would be no need to talk of estimates of rates. Unfortunately, the emissions do not occur at regular intervals nor is it practical to count for a very long time, so there is no escape from the uncertainty of estimation. There is a silver lining, however; it has been shown that a mathematical series called the Poisson distribution describes neatly the manner of occurrence of random discrete events (clicks on the counter, in this case) in a continuum (time), and the physicists use this fact to supply with the estimated date a statement of the magnitude of the error to be expected because the sample was counted for a finite period. This statement is the familiar standard error (or standard deviation) expressed as plus or minus a given number of years, and it implies that if the estimating procedure was repeated an infinite number of times, then two out of three of the estimates plus or minus the specified number of years would contain the true value. About 19 in 20 of the estimates would contain the true value in the interval plus or minus twice the specified number of years (2 standard errors), and about 369 in 370 estimates in a 3 standard error interval. Some laboratories inflate this strictly counting error to allow for other laboratory factors such as measurement of gas pressure and uncertainty in the measurement of the half-life of carbon-14 (for example, Crane 1956: 664), but the counting vagaries are the chief source of error. The purpose of this paper is to suggest methods of using this statistical information to make decisions about the meaning of the difference between 2 or more radiocarbon dates.

In both of the methods described below, I have assumed that the large number of counts recorded for each sample makes the distribution of differences between the estimated dates practically indistinguishable from that expected for differences between means of samples drawn from a normally distributed population and that the rounding of the published standard errors does not introduce any serious inaccuracy. An additional source of inaccuracy is the fact that the published dates give averaged plus and minus errors; actually, when the standard error is expressed in years the plus error is always greater than the minus error. This difference is not great for moderate ages. Crane (1951, Table 1) indicates for an age of 5568 years ago, measured under typical conditions, a plus error of 360 years and a minus error of 340 years. The corresponding figures for 11,136 years ago are 720 and 630 years. For these reasons, the techniques suggested here must be regarded as approximations which become progressively less accurate with greater ages. However, they probably will lead to the same decision as more refined methods in most instances, and they have the advantage of simplicity. In any case, they are considerably better than no method at all. If greater accuracy is wanted, it is necessary to work with actual counts rather than dates expressed in years.

The simplest case is that of comparing 2 dates, where it is possible to use the principle that the standard error of the difference of 2 independent quantities is the square root of the sum of the squared standard errors (variances) of the separate quantities. A good example is the situation at the Oconto site, an Old Copper cemetery in Wisconsin. Here material from 2 graves (Chicago samples 836 and 837-839) give dates of 5600 ± 600 and 7510 ± 600 years ago (Libby 1954: 740). Since the cemetery appears to be a cultural unit, the difference of 1910 years between the 2 dates is puzzling, and it is desirable to test whether or not so large a difference can be attributed reasonably to the counting error. The standard error of the difference between these dates (which can be regarded as means of samples with an infinite number of observations in each sample) is

$$\sqrt{(600 \times 600) + (600 \times 600)} = 848.5$$

The observed difference, 1910 years, can be expressed in units of the standard error as $1910.0 \div 848.5 = 2.25$ standard errors (a value expressed in this standard form is often called t), and from a table of areas of the normal curve or of t for infinite degrees of freedom the probability of obtaining so large a value can be read off. A value as large as the 2.25 standard errors for the Oconto dates would arise no more than about 25 times in 1000 if the published dates were in fact estimates of the same true date, and we conclude that whatever the explanation for the difference may be, it is not very likely to be the result of the random nature of the counting process or other factors incorporated in the published standard error. If the archaeological data strongly suggest contemporaneity, a suspicion of sample contamination may be in order. Had the difference been much smaller, say 0.84 standard errors, we would have noted that a value this large or larger may be expected in about 40% of differences between pairs of dates estimating the same true value, and it would seem legitimate to pool the 2 estimates to obtain one more accurate estimate. It is sufficient for most comparisons to note that the probability of a larger value of t for 2 estimates of the same true value is 50% for a t of 0.67, 5% for a t of 1.96, and 1% for a t of 2.58.

Reasoning of this sort can be extended to the problem of more than 2 dates, as in the case of a number of dates for similar village sites. The technique employed resembles that described for 2 dates; the standard errors of the individual dates and the variation among the dates themselves are compared. In more technical terms, the comparison is an example of the analysis of variance. The computations needed are the estimated variance of the list of dates treated as a set of observations in a single

sample, the variance of the individual dates treated as means of samples with an infinite number of observations in each sample, and finally the ratio of the 2 variances. The variance ratio is the value called *F* in the statistical literature, and this value and some additional information can be used to enter a table of *F* and read the probability that so large an F value would arise if all of the individual dates were indeed an estimate of a single date. One additional assumption is involved: that the number of counts is sufficiently large to offset the fact that in a Poisson distribution the variance is equal to the mean, a relationship which would make the *F* test invalid for small samples.

I have chosen for an example 4 datings of charcoal from a single tree burned by pumice from the Mt. Mazama eruption (Chicago sample 247, Johnson 1951: 8). We may expect that *F* will have an insignificant value under these conditions — obviously the dates are 4 estimates of a single date — and a significantly large value would probably indicate that a laboratory error had occurred. The data and computations are illustrated in Table 1.

TABLE 1. VARIANCE RATIO FOR FOUR AGE DETERMINATIONS OF CHICAGO SAMPLE 247.
(Data from Johnson 1951: 8.)

Measurement No.	Estimated Date (x)	Deviation from mean ($x - \bar{x}$)	Standard Error (s)
1	6,389	-104	320
2	7,318	825	350
3	5,938	-555	400
4	6,327	-166	400
$n = 4$	$\Sigma x = 25,972$		

$$\text{Mean of } x = \bar{x} = \frac{\Sigma x}{n} = \frac{25,972}{4} = 6,493.$$

$$\text{Variance among samples} = s_a^2 = \frac{\Sigma (x - \bar{x})^2}{n - 1} = \frac{104^2 + 825^2 + 555^2 + 166^2}{4 - 1} =$$

$$\frac{1,027,022}{3} = 342,340.67.$$

$$\text{Variance within samples} = s_w^2 = \frac{\Sigma s^2}{n} = \frac{320^2 + 350^2 + 400^2 + 400^2}{4} =$$

$$\frac{544,900}{4} = 136,255.00.$$

$$\text{Variance ratio} = F = \frac{342,340.67}{136,225.00} = 2.51.$$

Greater variance is s_a^2 with 3 degrees of freedom.

Lesser variance is s_w^2 with infinite degrees of freedom.

F at 5 per cent point for 3 and infinite degrees of freedom is 2.60;
calculated F at 2.51 is not significant at the 5 per cent level.

Some features of the computations need comment. The first is the use of n–1 rather than n to calculate s^2_a, the variance (mean square deviation) of the dates. This subtraction is made because the mean used in determining the deviations was also calculated from the dates, thus giving a biased estimate of the mean square deviations from the true mean, the value of which is not known. Subtracting 1 from the number of dates tends to counteract this bias, and the value n–1 gives the appropriate degrees of freedom for the variance among samples, 3 in this example. On the other hand, the mean of the squared standard errors (s^2_w) was divided by 4, the total number of standard errors; here each of the standard errors was derived from independent counts of large size, giving practically infinite degrees of freedom so that no subtraction is necessary. The variance ratio (*F*) is always computed with the larger mean square as the numerator, and consequently *F* is always 1 or more. Tables of *F* are 2 dimensional, the entering arguments being the degrees of freedom of the greater mean square and the lesser mean square. The values tabled are the 5% and the 1% points, that is, the values of *F* which would be exceeded in 5% or 1% of a very large number of instances when chance is the only factor producing a discrepancy between the among samples and the within samples variances. Although the variance among samples exceeds the variance within samples, our calculated *F*, 2.51, is somewhat less than the 5% point, 2.60, and the conclusion is that there is no particular reason to suspect anything but random counting fluctuations as the source of the calculated *F*. It is reasonable to pool the 4 estimates to give the best estimate for the true date because the among samples variance does not exceed the within sample variance by an amount too great to be attributed to anything but a genuine discrepancy or a wildly improbable freak of chance.

The computing routine of the table was chosen to exhibit the nature of the reasoning involved. In practice it will be found that the sum of squares among samples can be computed more easily as Σx^2 minus the quantity $(\Sigma x)^2$ divided by n, thus avoiding the necessity of calculating the mean and finding the individual deviations by subtraction. For the data of the table, the computation of the sum of squares would be:

$(\Sigma x)^2 = 25{,}972 \times 25{,}972 = 674{,}544{,}784$; $\Sigma x^2 = (6389 \times 6389) + (7318 \times 7318) + (5938 \times 5938) + (6327 \times 6327) = 169{,}663{,}218$; and $(\Sigma x)^2 \div n = 674{,}544{,}784 \div 4 = 168{,}636{,}196$.

The difference between Σx^2 and $(\Sigma x)^2 \div n$ is 1,027,022, the same sum of squares found by the method of the table.

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Albert C. Spaulding
University of Michigan
Ann Arbor, Michigan
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FLUTED POINT MEASUREMENTS

Paradoxically, in presenting fluted point measurements and proportions the percentage or ratio relationship of maximum (or minimum or average) fluting to total blade length is not completely a matter of mathematics. This seems to have escaped the notice of many students of the paleo-Indian flint industries. The problem involved has come to the attention of the writer in the course of studying several series of northeastern and Great Lakes area fluted points, with the result that he has been as frequently bewildered as enlightened in attempting to compare his data with those obtained by other archaeologists.

The problem is basically simple. As seen in most of the descriptive literature on eastern United States fluted blades — and this is probably applicable to the western Clovis material as well — the maximum length of a flute is usually obtained by measuring from the apex of the concave base up to the greatest extremity of the channel scar. Maximum blade length is determined, of course, by measuring from the tip of the specimen to the opposite end, which is generally taken as a straight line connecting the extreme edges of the basal tangs. Degree of basal concavity is then ascertained by determining the distance from this line to the basal apex. The question usually left unanswered after all of this is, then, precisely how is the percentage or ratio of fluting to blade length determined? The depth of the base can obviously affect the percentage or ratio obtained.

An example seems to be in order. Given a fluted blade 8.0 cm. long, measured as above, with a fluting scar length of 4.0 cm. beginning at the basal apex, and a concave base, say, 1.0 cm. deep, we obtain fluting to blade length percentages of 50 or 62.5, depending on whether or not we include the basal concavity with the fluting length in our calculations. Expressed another way, the result is a function of our including or excluding the tangs in our determinations of total blade length in the above operation. Now this is a discrepancy of 12.5%, and of potential significance in attempting rigorous typological and comparative studies when one student does not know what criteria of length another student has been employing.

It has been noted by a few archaeologists (for example, see Witthoft 1952: 481-2) that the depth of the concave base of many if not all eastern fluted points (Enterline and especially related eastern specimens, and probably

western Clovis as well) seems to be a function of the removal of the fluting channel-flakes, and that the prepared basal edge of the projectile point was straight or even slightly convex before the first channel flakes were drawn. As fluting is accomplished the basal edge assumes the characteristic concave form due to shattering and removal of the striking platform. This fluting and base shaping procedure has been repeatedly confirmed in the case of the specimens I have been studying.

Since fluting begins at a distance from the tip, subsequently largely retained by the tangs, it would seem that the actual fluting length must be measured from this line and not from the apex of the trimmed, finished base. Although the discrepancy involved can be corrected for in such publications as give fairly complete measurement details, the writer would suggest that in future publications the difference between "length of fluting" and "length of fluting scar" should be made explicit. I do not think that this discussion is a trivial picking at dry bones since, to my mind, a possible discrepancy of 12.5% or even more is a somewhat disconcerting thought when we are forced to use data that are meager enough even at best.

WITTHOFT, JOHN

1952 A Paleo-Indian Site in Eastern Pennsylvania: An Early Hunting Culture. *Proceedings of the American Philosophical Society*, Vol. 96, No. 4, pp. 464-95. Lancaster.

RONALD J. MASON
University of Michigan
Ann Arbor, Mich.
March, 1957

"LOCAL GROUPING IN MELANESIA": AN ARTICLE OF THEORETICAL IMPORTANCE

The article, "Local Grouping in Melanesia," by H. Ian Hogbin and Camilla H. Wedgwood, published in *Oceania* (Vols. 23 and 24, pp. 241-76 and 58-76, 1953, Sydney), has considerable theoretical importance for the study of social organizational-settlement relationships. I take this somewhat belated opportunity to call it to the attention of American archaeological colleagues. Most of us, including myself, do not consult *Oceania* in the ordinary course of events. I am grateful to a colleague, S. W. Miles, and to a graduate student, Kwang-chih Chang, for bringing the article to my notice.

Although they treat of Melanesia and ethnology, what Hogbin and Wedgwood have to say is of interest, not only to ethnologists in other areas but to archaeologists concerned with settlement pattern interpretation. The authors deal with the islanders of New Guinea, the Bismarck Archipelago, the Solomons, and the New Hebrides. They discuss kinship, local groups, and problems relating to social cohesion and stability, in that order. The natural setting of the societies investigated is tropical forest terrain. Food crops were grown on a system of shifting cultivation, with plots lying fallow for several years. Difficulties of communication made large concentrations of population impracticable:

> It follows that Melanesian societies are minute in scale. The same culture and language are often shared by thousands, but the widest social unit possessing a coherent system for the maintenance of internal order consists of the seventy to three hundred persons resident within the boundaries of a clearly defined area seldom more than a few square miles in extent. The members of this group occupy a village, a cluster of hamlets, or a series of neighboring homesteads and conduct their affairs independently under the leadership of their own headmen and prominent elders. (P. 242.)

Hogbin and Wedgwood analyze these Melanesian village, or "parish," groups as to kinship types and as to settlement or community types. Of the latter, they define five: (1) The Undivided Planned Village; (2) The Hamlet Pattern; (3) The Planned Village with Wards; (4) The Unplanned Village; (5) The Homestead Pattern. Their central concern is how community type and kinship organization "interlock and strengthen each other."

GORDON R. WILLEY
Harvard University
Cambridge, Mass.
May, 1957

MORE ON WOOD HARDENING BY FIRE

On page 179 of AMERICAN ANTIQUITY for October 1956, Aaron J. Cosner describes some experiments on the fire hardening of wood. Perhaps, in this connection, the following experience may be of interest.

During my boyhood in Michigan, corn was harvested entirely by hand. In the process we always used a husking peg to remove the husks from the ears. The peg was a small implement of steel or wood fastened to the hand by a loop around the second and third fingers. As there was very little money available in those days, nearly all the pegs were made at home of wood. They were usually of hard maple or beech about 5 inches long, ⅜ of an inch in diameter and sharpened at one end. The sharpened end, after being carefully scraped and smoothed, was "fired." This was done by holding the side of the pointed end against a live hardwood coal just long enough to bring it to a deep brown. If held too long, it would char and we would have to scrape it off and begin over. Holding it in a flame would not work as it would always char the wood. The end of the peg could also be hardened by holding it against a stove lid that was not quite red hot.

If we attempted to use the peg without "hardening," the point would soon become fluffy and fibrous. However, when properly fired, it would stand long usage without appreciable wear. I do not know how the heating affected the wood. Perhaps it only produced a highly seasoned outer surface or maybe it merely closed the pores of the wood. Anyway, it worked. No doubt it would be similarly effective on the points of wooden arrows or spears.

OREN F. EVANS
University of Oklahoma
Norman, Okla.
December, 1956

REVIEWS

Edited by Raymond H. Thompson

Prehistoric Settlement Patterns in the New World. Edited by Gordon R. Willey. Viking Fund Publications in Anthropology, No. 23, Wenner-Gren Foundation for Anthropological Research, New York, 1956. viii + 202 pp., 14 figs., 5 tables. $5.00.

A fad of anthropological writings today is the symposium. Such compilations have been the norm in the biological and physical sciences for some decades and their appearance in American archaeology clearly sounds the note of synthesis. This volume comprises the reports presented by invitation at a panel at the annual meeting of the American Anthropological Association in Detroit in 1954, together with a greater number of papers added after the meeting to obtain better geographic coverage of the continent. Rather than list specific titles, it may be sufficient to summarize the contents as follows: 4 essays are devoted to the Southwest (Haury, Reed, Wendorf, and Schwartz); one each to California (Heizer and Baumhoff), Southeast (Sears), Lower Mississippi Valley (Williams), Northern Mississippi Valley and Great Lakes (Griffin), Northeast (Ritchie), and Plains (Wedel); four to Mesoamerica (Shook and Proskouriakoff, Borhegyi, Willey, and Sanders); two to North Mexico (Kelley and MacNeish), and two to South America (Kidder, and Meggers and Evans); one to the Caribbean (Rouse); and, finally, an appraisal by Vogt.

In a short introduction Willey points up the problems: "These settlement arrangements relate to the adjustment of man and culture to environment and the organization of society in the broadest sense." Hence, the problems are happily shared by archaeology and ethnology. This, indeed, is why there is considerable current attention attached to such problems.

It is never an easy task to review a collection of related articles and it is more difficult when it contains a built-in review such as Vogt's appraisal. Certainly there is little to commend the volume as a closely-integrated work and the reader gains no sense of over-all accomplishment. Still, the merits of the articles far exceed any shortcomings.

Of the 4 articles on the Southwest, that by Haury is, intentionally, speculative. This whole volume is filled with speculations and Haury's are among the best. He makes as good a case as seems possible at the present state of our knowledge for the sociopolitical structure that may be inferred from ball courts, house arrangements, and relationships with water resources. Reed, with his usual meticulous craftsmanship, presents an organized analysis of village-plan layouts, even arriving at a general correlation of patterns and cultural chronology. Wendorf, discussing distributions, brings more critical comment on the possible social changes which are reflected in the village formal changes through time. He finds that clan growth is concomitant with community enlargement. Of course, so did Morgan. Schwartz's short article is unique among the Southwestern ones in having a map. It is further significant in indicating what may be garnered from quantitative studies of sherd collections. His methodology will bear study by eastern seriational devotees.

There are few parts of the New World so well documented and explored as California. Heizer and Baumhoff thus can delineate concisely the varying settlement configurations in that state. Not the least important is their noting that fairly accurate methods of reconstructing the habitational milieu of prehistoric peoples have been devised by several California workers but that the methods have not been tried elsewhere.

For the Eastern United States Sears has examined ethnographic and archaeological sources and from them has devised a scheme of classification of settlements based on areal size. Williams writes with ecological awareness of the relationships between culture and the physical environment. He establishes a series of periods in the Lower Mississippi Valley with appropriate habitation changes. His essay is well illustrated. Griffin points out the near absence of specific archaeological data on villages in the Northern Mississippi Valley, and, also, the difficulty of applying an arbitrary classification scheme such as Sears has suggested.

Northeastern North America may seem an enormous area but, like California, parts of it are well known archaeologically. Ritchie has developed a fine series of settlement pattern changes throughout the known time span. Wedel, dealing with the Plains, has a comparable situation and also presents relationships among environmental, social, and historical influences.

The articles on Mesoamerica rather clearly indicate how much more specific information about building distribution and town plan is available there as compared to northern areas. Sanders' article stands alone as the most exhaustive study of an area where archaeological and historical data are plentiful. He establishes settlements on population number whereas most of the other writers have used area as the criterion. After reading such an article as this, it is difficult to shift to the more detailed archaeological orientation of Kelley and MacNeish.

South America and the Caribbean are better presentations than most of the foregoing for the simple reason that they are based more upon ethnographic than archaeological data. Kidder ties most of the known Peruvian information into Willey's Virú Valley study. Meggers and Evans exploit ethnographic studies to the enlightenment of archaeology, incidentally, with good illustrations. Rouse also quite lucidly brings out the more important relationship between culture level and environment, rather than culture level and time.

In Vogt's "Appraisal," one finds a review of the problems, and suggestions relating to the several "needs" such as establishing typology, use of aerial photographs, more precise information of spatial relationships in sociopolitical structure, and value system relationships.

It has been indicated above that there is but little integration in this volume. This criticism usually may be made of the reports of any symposium, but there are several omissions in this instance that need not have occurred. The near lack of maps or graphic representations of settlements is made more obvious by the presence of a few excellent examples. It is virtually impossible to consider demography without cartography and the cost of line drawings is not so prohibitive that they should be left out. Also, an awareness of ecological factors as conditioning agents in settlements appears in only a few of the articles, such as Wedel's paper. Even though it is realized that each writer was limited in scope and length of discourse, it seems unusual that not one single reference is found to the voluminous literature in the Old World on the problems of settlement patterns. Clark's *Star Carr* was not available at the time of writing but his monograph shows what can be done in a specific study. Finally, this reviewer missed the names of Squier and Davis and Lewis H. Morgan. These shortcomings are not monumental and *Prehistoric Settlement Patterns in the New World* can form the basis for a truly significant contribution when someone draws the findings into a monographic report.

WILLIAM G. HAAG
Louisiana State University
Baton Rouge, La.

A History of the Ancient Southwest. HAROLD STERLING GLADWIN. Bond Wheelwright Company, Portland (Maine), 1957. xx + 383 pp., 175 photographs and drawings, 21 maps. $8.50.

Gladwin has written a lively and comprehensive narrative of the ancient American Southwest. He begins with the earliest arrival of people from Asia, 10,000 or more years ago, and describes migrations and settlements of the many prehistoric occupations made known through a century of exploration and excavation of antiquities. He ends his chronicle on the doorstep of our own history, which begins with Spanish discovery and conquest.

The Southwest, as defined by Gladwin, extends from northern Mexico to southern Utah and from the Gulf Coast of Texas to the coast of southern California. Altitude provides a third dimension and a great variety of local environments from true desert in the interior basins to Alpine tundra on mountain summits. Upon this vast and spectacular landscape Gladwin deploys his prehistoric men.

The theme of the book is migration and settlement by various groups of people descended from Old World immigrants. Gladwin identifies each group by combinations of biological and cultural traits. Inasmuch as direct evidence is lacking for languages, his ancient tribal groups are formulated on the evidence of skeletons, artifacts, and dwellings. He supplies flesh for the bones by inferences drawn in part from knowledge of historic Indian tribes.

Gladwin describes and names his ancient tribes and cultures without formal adherence to prior archaeological theory and terminology, but his departures from previous interpretations are truly impartial — he differs not only with other archaeologists but very often with pre-1957 Gladwin as well. However, his novel reconstruction of Southwestern prehistory is not designed for the sake of writing a brisk scenario or disconcerting his readers. Instead, he has attempted successfully to write about Southwestern archaeology in language understandable for laymen, and his prose is lucid and pleasantly free of technical jargon. His readers will disagree with some of his views about ancient events, but they will be grateful to have forthright propositions clearly stated.

Gladwin's prologue is a discussion of the racial composition of Old World people who settled in the New. He states very forcibly his conviction that the first arrivals were not Mongoloids. He refers to the physical characters of skeletal remains from early Southwestern sites and he invokes the authority of E. A. Hooton, R. B. Dixon, and Edna and George Woodbury to support his belief in pre-Mongoloid migrations by proto-Australoids, Melanesian-like people, and non-Mongoloid longheads. He does not mention the Mongoloid incisor teeth of shovel shape that the Woodburys observed in the 16 skulls from the Texas Gulf Coast nor does he discuss the opinions of specialists who disagree with the authorities cited. In the introductory chapters, some rather meager collections of early Southwestern skulls are described in such a way that the same specimens can be construed as having attributes of 2 or more distinct non-Mongoloid breeds of men.

1. Page 17. "You can form a fairly good idea of what the early settlers may have looked like if you can conjure up a sort of composite portrait of a Dravidian Untouchable, a Hairy Ainu, and an Australian Blackfellow — all of whom were also good Australoids."

2. Page 29. "The gist of all these statements and opinions is that there was once a well-recognized long-headed physical stock of low to medium stature which occupied the area lying between the Channel Islands, off the coast of southern California and central Texas. This stock appears to have been very widespread in ancient times, with a southward extension to Mexico and Brazil, and there is a suggestion of relationship to Melanesian people in the southwestern Pacific — all of which points to an early, distinct, and separate migration from eastern Asia to North America.

Thus characterized, these human races merit the name of non-Mongol mongrels. But whatever they are called, in Gladwin's book they merge to become the first distinct physical type of man in the Southwest.

Gladwin associates distinctive material culture and psychological traits with human breeds. These traits persist with variable degrees of dilution through centuries and millennia, yet they remain recognizable in archaeological deposits. His prehistoric tribes carry some of these traits in their genes, and others in their jeans.

Advancing next in time toward the end of Gladwin's North American Stone Age, "within a century or two before the birth of Christ," he populates the Southwest with local settlements of non-Mongoloids whom he calls the First Families. These (Hunters, Foragers, Cave Dwellers, and preagricultural Basket Makers)were racially intermixed to constitute a longheaded breed descended

from the proto-Australoids and other non-Mongoloids mentioned above.

Having set the stage for the Southwestern story, Gladwin comes to grips with the abundant archaeological evidence collected by himself and his associates at Gila Pueblo, as well as by hundreds of other investigators. With all the vigor of an archaeological Macauley, he develops a narrative encompassing virtually all of the prehistoric cultures known from A.D. 200 to Spanish times. Century by century, he traces the movement, settlements, and fortunes of distinctive tribes and cultures.

Beginning in southwestern Colorado, he describes a group of Mongoloids with medium-broad undeformed skulls, who enter the Southwest about A.D. 200 from the east, bringing new traits and new blood to the borders of Basket Maker territory on the Colorado Plateau. These emigrants, called Farmers, settle north of the San Juan river, expand westward, and maintain their ethnic identity throughout later centuries until they emerge in the 13th century as the Mesa Verde pueblo people.

Meanwhile, the earlier Basket Maker longheads established on the south side of the San Juan, begin to migrate south and southeast. From the blood and culture of the Basket Makers, blended with southern people, are derived the pueblo groups south of the San Juan.

Turning far to the south, Gladwin picks up the migration of a third distinct physical type of people who enter the Southwest from Middle America. After crossing the border about A.D. 600, these people appear as Mongoloids with broad, low-vaulted skulls, artificially deformed. They bring the art of making red pottery, and for that reason Gladwin calls them Reds.

Some of the Reds mix with the Cochise Foragers to constitute the Mogollon culture. The Mogollon people, thus established, stay put during later centuries as a small enclave in southwestern New Mexico and southeastern Arizona. The Mogollon population must have remained very small indeed, for Gladwin says, "I doubt if they ever numbered more than three hundred . . ." (p. 133).

Other Reds meanwhile moved northward as far as southern Utah, bringing Mongoloid blood, deformed skulls, and red pottery to tribes and villages north of the Mogollon Rim. About A.D. 1000 one group of Red-like people move southward again and across the border into Chihuahua. Still other Reds move eastward to share in forming the historic Caddoan tribes.

Despite the potent impact of the Reds upon other ancient cultures, as claimed by Gladwin, they materialize as gypsies without past or future. Of their past before A.D. 600, Gladwin says: ". . . nothing is known of their background before they reached the Southwest . . ." (p. 78). Of their entry into southwestern New Mexico: "Here, a trickle of Reds which had been filtering into the Cochise Foragers during the 600's had grown to a steady stream by A.D. 700" (p. 95). Of their migration northward through the Verde Valley: ". . . we follow the Reds as they swarmed up on the Plateau" (p. 147). Of their future: "From the deserts in the south to the forests in the north, the Reds had mixed in varying degrees with Cochise Foragers, Upper Gila Cave Dwellers, Hohokam, Yuman Foragers, Basket Makers and Farmers, and at A.D. 800, it would have been hard to find an unadulterated Red man or woman" (p. 179).

From Gladwin's text, the Reds can be summarized thus:

Origin: unknown.

Duration of identity: less than 200 years.

Number: streams and swarms.

Territorial settlement: 1,000,000 square miles.

Transportation: Shank's mare.

Migration routes: uphill all the way.

Culture: occipital deformation of skulls and polished red pottery; possibly, plain brown ware and small circular houses.

Culture contacts: "The point which stands out in all these meetings and mergers is that they were invariably peaceful" (p. 194).

Language: "And it is to be supposed that the language of the Reds was unintelligible to anyone in the Southwest at A.D. 700" (p. 209).

Destiny: "Nowhere is there to be found any indication whatever of defensive works which would imply resistance by the residents, or any other sign of warfare. On the contrary, it appears that by A.D. 800 the migration had run its course, the Reds had been absorbed, and out of the various resulting combinations it is possible at A.D. 900 to perceive incipient cultures beginning to form. We can see each of these seven cultures — Mesa Verde, Chaco, Kayenta, Cibola, Mimbres, Mogollon, Hohokam — as distinctive entities at A.D. 1000 . . ." (p. 209).

The 7 cultures mentioned bring the story to the threshold of the so-called Classic period of Southwestern prehistory. Although 6 of them derive from mergers of long-term and short-term inhabitants, the seventh (Hohokam) comes from an overland migration of southern people by way of the west coast of Mexico and the lower Colorado River to the Gila-Salt desert lands about A.D. 700 (map, p. 76). The Hohokam arrive full-fledged, with an advanced culture based on canal irrigation. Once settled, they expand very little, and their contacts are represented by a limited dispersal of Hohokam traits and some mixing with wandering Reds. The Hohokam cremated their dead, and Gladwin is silent about their racial identity.

The growth of these 7 cultures into stable territorial societies is traced through the period from A.D. 1000 to 1200. But no sooner do these communities get on the high road to civilization than their downfall is heralded by the arrival of a new people. These are the Athabascan-speaking Navaho and Apache who come from the north during this period to raid and desolate the peaceful agriculturalists of the Southwest.

Gladwin concludes his story with archaeological records of territorial abandonment, population shrinkage, tribal movements and extinctions, from A.D. 1200 to 1540.

Many archaeologists will disagree with Gladwin's interpretations of evidence, but few will quarrel with his purposes in pursuing the ancient people so diligently and comprehensively. Despite his forthright approach,

he is not dogmatic. Nowhere in his book does he claim mystic revelation. He offers, instead, his reconstruction of archaeological rubble in the public domain and he invites others to reassemble these "sticks and stones, pots and bones" into a better story if they choose. I think he has succeeded here, as he has for 30 years past, in stimulating other archaeologists to produce sound evidence for their own interpretations of prehistory and to present their special knowledge to the public in literate style.

His view of research is well stated on the final page, where he reasserts his challenge to complacency. In response to his challenge, I have here questioned in some detail his story of the Reds. I have done so for 3 reasons: (1) the Reds are an independent invention of Gladwin, who is a confirmed believer in world-wide diffusion of ideas; (2) this far-wandering Red group of culture bearers aptly illustrates Gladwin's prevailing conception of mechanisms for culture transmission; (3) Gladwin, in all his recent publications, has drastically updated the age of sedentary agricultural communities south of the Mogollon Rim.

By dating the beginnings of Hohokam and Mogollon cultures at about A.D. 700, he has found it necessary to explain Southwestern cultural developments by sending the Reds on forced marches. In spite of language barriers, they transplanted ideas and industries far and wide among isolated and diversified groups of aborigines. We are asked to believe that, by their peaceful wandering, the Reds accomplished all this in less than 200 years.

The novelty of Gladwin's interpretation of circumstantial evidence is certain to lead to further examination of such problems as these, and in that sense his challenging views stand as an important contribution to Southwestern prehistory. But what is more important, he reminds us that antiquities cannot be wholly comprehended in weights and measures. The archaeological record must always be partly apprehended by imaginative speculation about extinct people who neglected to write their own history for us.

ROBERT F. BURGH
Peabody Museum West of the Pecos
Tucson, Ariz.

The Upper Pima of San Cayetano del Tumacacori. An Archaeohistorical Reconstruction of the Ootam of Pimería Alta. CHARLES C. DI PESO. David A. Breternitz, Dick Shutler, Jr., Hugh C. Cutler, and Lawrence Kaplan, collaborators. Amerind Foundation, Publication No. 7, Dragoon, 1956. xxiv + 589 pp., 83 figs., 147 pls. $15.00.

In this hefty volume, 3 separate though closely related major subjects are presented: a detailed report of the findings of excavations at the Paloparado site on the Santa Cruz River north of Nogales in southernmost Arizona, and the ethnographic picture into which they fit; a discussion of the history of Pimería Alta from 1688 to 1767 and of the identification of the ruins at Paloparado as the historic Pima village, to 1751, of San Cayetano de Tumacacori; and a general reinterpretation of the archaeology of southern Arizona.

The organization of the monograph is unusual, and at first confusing. The normal presentation by categories of material, customary in archaeological reports — structures, burials, pottery, other clay objects, stone, bone and shell, etc. — is only partially followed. Di Peso attempts instead to organize his material ethnologically, in terms of aspects of human life: appearance, dress, and ornaments; architecture and building tools; pottery, weaving, including basketry, and weaving tools; religious objects; food; warfare; death practices. Possibly this method, if it comes into regular use, may prove superior once we have become accustomed to it. Personally, I find it slightly confusing, and would prefer to have a recapitulation by category of use with ethnological interpretation separate from the description of objects found. Especially does this apply to the present work, as there are other peculiarities of procedure which make it even more difficult to follow.

In each descriptive chapter, the "Upper Pima" material (from the later occupation, into the historic period, at Paloparado) and the "Hohokam" material (the earlier phase there) are presented separately, and then that category of material is discussed more or less generally. But there is frequent comparative discussion within the descriptive sections, and I do not get a clear picture of just what items were found at Paloparado and what their relationships were within the site. Full details are carefully given, however, and generally are set off in small print (along with distribution and comparisons); the earnest specialist can find the data. But the unfamiliar effect is one of using the archaeological finds to illustrate an ethnography, instead of describing archaeological material and then identifying and explaining it.

There are, in addition to an abundance of normal photographs of specimens and excavations, numerous interesting, skillful, and clever drawings by Barton Wright — many of them resembling explanatory museum exhibits; and often, like many museum exhibits, a bit crowded and difficult to follow. Editorially, there seem to be few typographical errors (except for Swarts ruin, consistently misspelled — or not consistently; twice on a single page spelled 2 ways). However, there are a number of poor usages, for example: "infer" for "imply" and vice versa, a little unnecessary Latinity (occasionally wrong, such as "post" for "infra"), and circumlocutive phrasings, such as that some items "had a number of diagnostic traits pertaining to descriptive ceramic trends that were similar" — which I take to mean that their kinds of pottery were alike in some respects.

Far more important than these carping remarks, and more important than the somewhat debatable question of Di Peso's identification of the Paloparado site as San Cayetano de Tumacacori of 1691-1751, is interpretation of the prehistory of Pimería Alta. A new term, Ootam, is introduced for the remains considered to represent ancestors of the Upper Pima, and the name Hohokam is restricted to the distinctive material of Mexican affiliation which is thought to represent a special immigrant

group quite localized in space and time. The theory is first adumbrated in the introduction:

> The physical evidence found at San Cayetano [Paloparado] indicated that there was little, if any, break between the end of the Hohokam occupancy and the beginning of the Upper Pima Village. . . . The Upper Pima (or late Ootam) culture, when compared with that of the Hohokam of the older village, indicated that there was little, if any, relationship between the two villages at this site. A review of the San Cayetano Upper Pima culture indicated that it was a probable off-shoot of the earlier complex defined by Sayles as the San Simon branch of the Cochise culture which was existent in Pimeria Alta before the Hohokam entered the area. This indigenous culture has also been recognized at sites such as Ventana Cave and the Pioneer Period at Snaketown. The ensuing study indicates that sometime, perhaps around 1000 A.D., a group of emigrants from Mexico known archaeologically as the Hohokam, entered Pimeria Alta with a recognizably different material culture complex and took over a number of river valleys such as the Middle Gila and the Salt. They extended their domination throughout Pimeria Alta and were co-existent with certain indigenous Ootam villages such as Gleeson, Tres Alamos, and Valshni Village. Native Ootam, or Piman, myths state that the Hohokam were then driven from the area, and archaeological evidence at San Cayetano did not contradict this. (P. 19.)

This hypothesis is repeated and expanded, though with very little systematic presentation of evidence, in the discussions of architecture, food, and death customs, and is more firmly stated as we go, losing any hesitant character, for example:

> After the Ootam (mayhap in the company of certain Mimbrenos) drove into Pimeria Alta from the east and broke the Hohokam hold on the river valleys, a period of peace ensued. However, it was not long lasting, for a group of natives identified with the building of the Great Houses attempted to gain control of the Middle Gila and Salt drainages. The material culture of these Great House builders was essentially the same as that of the other Ootam villages of the Reassertion Period, and it is not known what inspired this social move. (P. 508.)

(For that matter, we don't know that it happened.) The same ideas are finally outlined again and more fully in the final chapter. The periods of cultural development in southern Arizona are stated as follows: Preceramic Ootam, ?-A.D. 400; Formative Ootam Period, A.D. 1-400 to 900-1000, period of kin-groups settlement; Hohokam Intrusion Period, 900-1000 to 1250-1300, period of migrations; Ootam Reassertion Period, 1250-1300 to 1690; and Period of Spanish Contact, beginning with Kino in 1691.

Now, very likely much of this may be essentially valid, but it would go over better if presented more carefully and more tentatively, less abruptly and flatly, and without setting up a new culture or pattern or root. The name Ootam is a perfectly good term, but it and the material it is here used to denominate could be called a branch of Mogollon, which is by now fairly generally accepted —a classification which is actually implicit in Di Peso's constant reference to "the Mountain Mogollon." In fact, simply saying "Desert Mogollon" would have obviated the need for a new term. Moreover, the hypothesis should be given as such, with more discussion of alternative views. The basic idea probably is essentially sound —several of those close to the subject have felt for some time that much of the southern Arizona material, clear west into the Papaguería, is not Hohokam in the strict sense and that the Hohokam culture, in a strict sense, is of specifically Mexican derivation. But the more general view, whether or not more likely to be nearer the truth, has pictured a relatively small immigrant group, bringing many new ideas and exerting an immense cultural influence.

No particular evidence is presented by Di Peso for the idea of a great native insurrection between 1250 and 1300, overthrowing and evicting the Hohokam; and there seems to be no reason for not considering as equally possible, or more likely, intermixture and absorption. The myths or traditions involved apparently could, so far as I know, all apply to the much later struggle with the "Great House builders." In many traits, though not to the great extent we thought we saw at Snaketown 20 years ago, there certainly are continuities clear through from early periods to modern Pima; for example, the utility plainwares of the Hohokam and Upper Pima phases at the Paloparado site are identical. Traits of the "Ootam reassertion" period here generally resemble those of the "Classic period" of the Hohokam in the Gila-Salt basin.

On a related topic, Di Peso is less radical than I would like. Several of the indications that the "Great Houses" idea came from further south in Mexico are mentioned, but credence still is given the unconvincing view of Anasazi derivation. And, incidentally, he also follows the theory, which I have been trying occasionally to challenge and assassinate, of a sizable Anasazi migration into the Mimbres in connection with the black-on-white pottery development in that area.

Di Peso's publication on the Paloparado site and the archaeological history of the Upper Pima Indians is a massive and important piece of work, reporting in detail on extremely skillful and thorough field excavations, compiling a great deal of very useful ethnological and historical information, and offering a quite brilliant, though sketchy and not completely convincing, hypothetical reconstruction of what might have happened in southern Arizona over the last 2000 years. I believe it would have been more effective to present each of these 3 major topics entirely separately, in order to have given a clearer picture of the findings at the Paloparado site, a more balanced ethnography, and a more coherent or closely-knit and more extensively discussed general hypothesis.

There are, I gather, a number of discrepancies and questionable interpretations of specific data, more important than the comments in my first few paragraphs and more technical than the rest of the above, which will no doubt be taken up in various ways by those conversant with details of the subject. Certainly this is a book which will provoke discussion among specialists. I regret that I must consider it much less satisfactory than Di Peso's previous major studies on the Babocomari village and Quiburi.

ERIK K. REED
National Park Service
Santa Fe, N.M.

Newberry Cave, California. GERALD A. SMITH, WALTER C. SCHUILING, LLOYD MARTIN, RITNER J. SAYLES, AND PAULINE JILLSON. San Bernardino County Museum Association, Scientific Series, No. 1, San Bernardino, 1957. 59 pp., 20 pls., 13 drawings, 1 map. $2.50.

The spare time and combined efforts of 80 amateur archaeologists over a period of some 2½ years have resulted in the excavation of Newberry Cave in the Mohave Desert of southeastern California and the preparation of this report. The lack of professional polish is most evident in this small monograph: maps are poor, photographs not sharp, bibliographic citations incomplete, artifact provenience far from adequate, and the concluding section not well thought out. However, considering the conditions under which the work was done, the background of those participating in the excavation and preparation of the report, and the fact that results of any kind were obtained and published within a reasonably short time takes most of the bite out of the criticisms listed above. The amount of archaeological material irrevocably destroyed by pot hunters, and the number of artifacts which are never available for public inspection or study as a result of private collecting prompts this reviewer to heartily congratulate the amateurs involved in this work.

A description of specimens obtained from the 4 rooms of the dry cave during a salvage excavation constitutes the major portion of the report. Included among the items found were: pictographs in red, white, black, and green; atlatl hook, sandals, bone awl, feathered plume, paint pigments, cordage, fire block, atlatl shafts, sheep dung pendant, projectile points, and split-twig figurines.

In the concluding section a "distinct likeness' to the Gypsum Cave culture is seen by the authors, although they admit no extinct animals were found in association with the Newberry Cave artifacts. It should be pointed out that the items of correspondence between Gypsum Cave and those exhumed at Newberry are general, and except possibly for some of the projectile points, there are no significant specific likenesses. The authors also make the assumption that all the material found belongs to one culture. This is a reasonable supposition due to the nature of the site but again there is no substantiation for it.

One group of artifacts which deserve special mention are the split-twig figurines. Heretofore figurines of this type have been found only in the upper Colorado River area in the vicinity of the Grand Canyon and the Muddy River. Their appearance in southern California greatly extends their distribution. Recently figurines found in the Grand Canyon which appear very similar to those illustrated in the Newberry Cave report have been dated by the radiocarbon method at about 1500 B.C. If the other material found at Newberry Cave was deposited by the figurine makers then it provides a unique glimpse into their nonfigurine artifacts and activities. It is also of interest that the authors independently arrived at a conclusion concerning the use of the figurine cave similar to that reached in the course of the Grand Canyon work. At both places the caves show little if any continuous occupation and were relatively inaccessible. These and other considerations led to the hypothesis that they were used for ceremonial hunting ritual.

Certainly the authors of Newberry Cave have shed light on the prehistory of an interesting and little known region. It is hoped that some of the problems they raised will be answered in future numbers of the San Bernardino County Museum Association Scientific Series. But it is recommended that as much time be spent studying the recovered collections and planning the publication as is spent uncovering the materials.

DOUGLAS W. SCHWARTZ
University of Kentucky
Lexington, Ky.

Klamath Prehistory. The Prehistory of the Culture of the Klamath Lake Area, Oregon. L. S. CRESSMAN. Appendices by William G. Haag and William S. Laughlin. Transactions of the American Philosophical Society, n.s., Vol. 46, Pt. 4, American Philosophical Society, Philadelphia, 1956. Pp. 375-513, 73 figs., 20 tables, 3 charts, 5 maps. $2.00.

Klamath Prehistory achieves an enviable goal: it traces convincingly and lucidly the prehistory of the Klamath Lake region, Oregon, from about 10,000 years ago to the ethnological present. For most archaeologists the kind of data required to do this are not available. Cressman, through a series of planned excavations conducted between 1947 and 1951 and the fortunate circumstance of a native population not given to wandering, is able to show this cultural continuity and to extract from his data some interesting observations on the processes of cultural adaptation to ecology.

In his role as a culture historian, Cressman first assumes the cloak of the ethnologist, giving us what is probably the best summary of Klamath culture extant, pointing out especially the gradual adjustment of the people to a marsh-riverine environment and the extent of their assimilation of outside cultural factors. This establishes the base for his examination of the archaeological remains.

In quick review, these are: (1) Medicine Rock Cave, believed to have been intermittantly used from before the Mount Mazama eruption (circa 6500 years ago) to historic times. (2) Kawumkan Springs Midden, an extensive deposit of trash with an estimated life span beginning perhaps as long as 10,000 years ago and extending to 1700 years ago. This midden produced well over 5000 artifacts derived from 4 arbitrary levels, on which judgments of changes in typology, economic dependence, and outside relationships are based. Several house pits dug into the midden are regarded as of postmidden age but nonetheless the oldest houses of all of those excavated. (3) Klamath Houses: to add breadth to the archaeological evidence and to provide a more than artifactual link between the past and the present, Cressman selected an extensive series of Klamath houses ranging from the

time of contact to precontact times in age. An over-all time range of perhaps 2000 years is represented by the architecture. It should be noted that in the absence of stratigraphy and other chronological controls, the house sequence was determined by implement typology.

In the Kawumkan Springs Midden study, Cressman shows both the precision of his excavation techniques and the basis for his approach to classification. He assumes right off, as I think the archaeologist must in spite of arguments one hears to the contrary, that artifact form patterns existed in the minds of the makers, that attempts were made to follow these patterns, but that variations were inevitable. Rather than to establish innumerable types based on variance, the latter are abstracted into patterns using form, size, and proportion as the measurable quantities. Cressman is careful to note that "probably in no case is any point exactly like our drawing" (p. 411) in the data-recording charts. In spite of this manifest "lumping," a rather bewildering array of point forms still confronts the reader. In the final analysis and in the interpretation of the data, it appears to me that this manner of gleaning the evidence was fully as effective and productive as if a far more minute system of scrutiny had been followed.

Cressman introduces one device the value of which I question. This is the use of what he calls "original" and "adjusted" numbers and percentages of artifacts. The actual number found are shown as "original" and the "adjusted" value represents the frequency in percentages of artifacts had the same amount of dirt been handled in each level. Obviously, the assumption is that the artifact concentration would have been the same throughout the midden. Fortunately, the distinction between these 2 values is clearly drawn and the results may be accepted or rejected readily. I am reminded here of the old adage "a bird in hand is worth two in the bush" (or was it four?).

Shifts in food economy from early to late come in for special attention and this proves to be an important contribution of the book as well as a significant element in Klamath Lake-Great Basin relationships. Cressman has done this by viewing both direct and indirect evidence and he has taken time out to sketch the bases and limitations for his inferences. He finds that the earliest residents of the Klamath Lake region, like those of the Great Basin, subsisted on many kinds of food animals and that there was full exploitation of the vegetal resources. Only the use of fish distinguished the former area. Through time the food habits of the Great Basin people remained relatively unchanged while the Klamath Lake residents slowly became dependent upon the products of rivers and marshes. It is suggested that this specialization was due to the stable and distinctive ecology of the Klamath Lake area, apparently not subjected to recent climatic changes as was the Great Basin. The pattern was established during the Altithermal when the Northern Great Basin was partially depopulated.

In general, perhaps Cressman's reconstruction of the Klamath Lake prehistory, in relation to the Great Basin, correlated with climatic shifts (Antev's terms are used) is one of the most provocative contributions of the monograph. Whether students of Great Basin prehistory agree with him or not seems relatively unimportant at this stage. What has meaning is the fact that here is an attempt to view culture, continuity, and change, anchored in the present and related to the climatic record.

A useful chart (p. 464) of time relations in the northern Great Basin accompanies a thorough-going analysis of Klamath area cultural development. Dependence is first placed on the usual medium for arriving at relative dates, namely artifact types, with full cognizance of the dangers inherent in this device, and a timely sketching of the conditions that had to be fulfilled before the data could be accepted. Referent cultural materials are principally projectile points of several forms and the 2-horned mano. The time level for the latter, about A.D. 1540, is taken from an occurrence in Pecos Pueblo in distant New Mexico. Three "absolute" dates are also relied upon. Two of these are based on radiocarbon analysis: the Mount Mazama eruption at 6453 ± 250 years ago which helps in aging the Medicine Rock Cave deposits and a date of 430 ± 165 years ago for a Klamath pit house. The third date, and here my quotes around the word "absolute" must be removed, is the year 1864 marking the signing of the treaty between the Klamaths and the U.S. In some respects, the dating controls whether relative or absolute, for establishing so long a cultural sequence seem feeble, but Cressman has clearly obtained within permissible limits the most he could from the data at hand.

Included in the monograph are 2 appendices, the first by William G. Haag on "Prehistoric Dogs from the Klamath Indian Reservation," and the second by William S. Laughlin on "Human Skeletal Material from Kawumkan Springs Midden." Haag presents us with the interesting information that the Klamath specimens support the generalization that the small dog preceded the large dog in time wherever the archaeological record has been long enough and provide the southernmost distribution of the Siberian type of dog. The time of appearance of this type of dog was perhaps as early as the second or third millennium B.C.

A few minor points in relation to the illustrations in this monograph ought to be noted. While I am a firm believer in the photographic documentation of in situ associations as a means of augmenting one's notes, I nevertheless have come to the conclusion that the majority of such records are unsuited for reproduction in a report. Most of them for one reason or another are actually meaningless other than to show that digging was done. Cases in point in the present monograph are the pictures on pages 490 and 497. But I freely admit that it is difficult not to violate one's own precept in this respect. Cressman introduces a series of figures (pp. 502-5), each of which shows the artifactual content of house pits. These are most useful in establishing a quick comparison between different houses, as for example between the pits that produced iron and some lithic material and those in which stone was predominant and iron was lacking. Obviously, too little material or too

much sets the limits for the effectiveness of this device, but the result here is excellent.

This volume, in sum, is a significant and solid contribution to the prehistory of the Northern Great Basin. Beyond its factual contents it contains many challenging ideas not touched upon in this review. And above all it stands as a model for linking ethnology and archaeology. Its appearance should be welcomed by all of those who are interested in Great Basin prehistory.

EMIL W. HAURY
University of Arizona
Tucson, Ariz.

The Effigy Mound Culture of Wisconsin. CHANDLER W. ROWE. Milwaukee Public Museum, Publications in Anthropology, No. 3, Milwaukee, 1956. 103 pp., 36 figs., 17 tables. $2.25.

This study was designed to provide a general descriptive and interpretative account of the Effigy Mound culture, a complex noted for the use of burial mounds shaped in animal forms and having a distribution centered largely in the state of Wisconsin. It is in part a summary of previously published material, but new data on excavations in the Raisbeck Mound Group, Grant County, Wisconsin, are also included. In 1932 a Milwaukee Public Museum field party under the direction of W. C. McKern excavated 20 mounds of a total of eighty in this group. As in most burial sites of this culture, the quantity of artifactual material recovered was scanty so that considerable difficulty is encountered in attempting a cultural reconstruction. Rowe combines this new material with that from previously excavated sites to compile a general description of the culture. The complex is compared with others in the region and its temporal placement and the question of the significance of the effigy mounds themselves considered. It is concluded that the Effigy Mound culture is an indigenous development in the Wisconsin area, of basic Woodland origin with little discernable external influence. The time range is described as being considerable, initial components equating in time with early Wisconsin Woodland and Hopewell and persisting until the time of the introduction of the Mississippi culture. Rowe believes the interpretation of the effigy mounds as clan symbols can be discarded and speculates that they may be associated with "certain ceremonial practices, perhaps some religious rite involving animals" (p. 90).

The rejection of the very early interpretation of the effigy mounds as clan symbols is based upon a procedure involving a listing of various clan names associated with tribes at some time resident in the region and comparing these, grouped into reasonable categories, with identified effigy mound forms. While the sources of the clan names are not cited, these would appear to be composite lists derived from all available sources. Since none of the historic tribes possess the total number of clan names to equate with the listed effigy forms and the greater number of mounds are conical, oval and linear in form, the concept of clan identification for the mounds is rejected. The argument would appear to lack strength. Aside from the uncertainty involved in attaching specific names to the animal or concept symbolized by the mounds which Rowe admits, implicit in the argument is the idea that each of the tribes involved had a fixed number or kinds of clans from earliest times and also that the significance of mound construction underwent no change from early to late phases of the culture. This may well be in error. The alternative suggestion of association with "ceremonial practices" could well be valid but it would seem that other, more specific possibilities might have been explored. Since the mounds are burial mounds, it is reasonable to assume that they perpetuate the affiliation of the individuals buried in them (whether clan, guardian spirit, or whatever) or perhaps of the individuals performing the burial services.

The impression is conveyed (pp. 51, 75, 89) that the Effigy Mound people were hunters and gatherers and not agriculturalists. At the time Rowe's study was written (the preface is dated 1951 and only a few sources published since that time are cited), direct evidence for agricultural activity in prehistoric Wisconsin would have been largely limited to the Middle Mississippi site of Aztalan, a manifestly unreasonable position. Evidence derived primarily from burial practices could well be seen as throwing little light on this aspect of their life since Rowe does not admit the existence of excavated Effigy Mound villages (p. 51). While the population was doubtless mobile, this does not necessarily preclude horticulture, and in view of the strength of influences from farming peoples cultural borrowing may also be greater than Rowe admits. Domesticated plants in all probability formed a basic part of their economy.

But a more fundamental criticism may be made of the study. Although lip service is given to typology as an approach, the artifact descriptions are for the most part extremely broad in character. Pottery types are rejected because it (the pottery) "is exceedingly generalized and it becomes difficult to break it down into types that have meaning" (p. 59). Projectile points are similarly placed in broad descriptive categories of little utiltiy for comparative work. A precise typology is one of the archaeologist's most powerful tools and without it cultural comparisons and chronological sequences lack assurance and precision. It may well be through this defect in his approach that we find no attempt to break down the Effigy Mound culture into developmental stages though perhaps this was regarded as beyond the scope of his task. Similarly, Rowe would appear to accept all mounds in a group containing effigy mounds as belonging to the Effigy Mound culture. An initial approach which questioned whether all of the mounds were made by one people and during a limited segment of time might be regarded as a basic procedure. Does the unusually large number of multiple burials in Mound 77 of the Raisbeck site reflect a natural catastrophe, a changing pattern of burial customs, or perhaps an entirely different cultural group? Such detailed analysis is slurred over for a broader interpretation. The broader summary, while

needed and excellent in conception, still lacks a precise analysis to serve as a base for generalization.

The study is abundantly illustrated and the photographs, together with the report on the Raisbeck site, provide important information on the Effigy Mound culture.

DAVID A. BAERREIS
University of Wisconsin
Madison, Wis.

Excavations at Kolomoki, Final Report. WILLIAM H. SEARS. University of Georgia Series in Anthropology, No. 5, University of Georgia Press, Athens, 1956. vi+114 pp., 21 figs., 9 pls., 14 tables, 6 charts, 5 maps. $3.00.

With the publication of this final report, 5 years of field work at the Kolomoki site, Early County, Georgia, are summarized, and Sears's final conclusions are set down within 8 years of the initial excavations in 1948. This is something of a record for prompt analysis, since the manuscript was actually completed by 1954. Three seasonal reports (*Univ. Ga. Ser. in Anth.*, Nos. 2, 3, 4) have been published, as well as several separate articles (Sears 1952, *Fla. Anth.*, Vol. 5, Nos. 1-2, pp. 1-7; 1953, AMER. ANTIQ., Vol. 18, No. 3, pp. 223-9) by the same author, who directed the excavations.

This final volume makes a total of well over 300 pages devoted to the Kolomoki site and its interpretation. Such voluminous attention to a single site makes Kolomoki unique in the eastern United States, where no other site has had so much written about it, and few have been excavated on such a large scale in the postwar period. All these factors make this final report a very important document for students of American prehistory.

The volume is divided into 10 chapters. The introduction contains a review of the prehistory of Georgia with Kolomoki placed in this frame of reference. The second section describes the excavations in brief, as detailed accounts of most of the digging are to be found in the seasonal reports. A discussion of the artifacts, mostly pottery, makes up Chapter 3; and this is followed by the important section on the ceramic seriation. Chapter 5 is a brief summary of the mortuary practices. Complicated stamping, the main decorative mode for the utilitarian pottery, is treated in the sixth section. The Weeden Island culture and its position in the archaeology of the Gulf Coast plain are the subject matter of the next 2 chapters, and section 9 deals with Southeast connections as a whole. The final chapter is a synopsis of the Kolomoki culture, which is followed by a short appendix on the archaeozoology by William R. Adams.

Sears presents a sequence of 4 cultural components (or periods), and has termed these complexes Weeden Island Ia and Ib, Kolomoki, and Lamar, in that order from earliest to latest.

The Weeden Island Ia period is marked by pottery of the Weeden Island series with Weeden Island Incised of the zoned variant the dominant type. Plain ware makes up 65% of the count, and Little Kolomoki and Napier Complicated Stamp occur as minority wares. The only features on the site associated wtih this period are washtub-shaped refuse pits. This material is equated with Willey's Weeden Island I period.

The Weeden Island Ib period is characterized ceramically by the decrease of the Weeden Island series. The Complicated Stamped series increases in importance at the expense of the Weeden Island types and plain wares. The stamped pottery reflects the transition from Little Kolomoki Complicated Stamp to Kolomoki Complicated Stamp and a minority type is Wakulla Check Stamp. Only midden deposits are known, but plaza and temple mound use is assumed to begin. The period is equated with Willey's Weeden Island II.

The Kolomoki focus component is the dominant complex on the site, and the majority of the material excavated has been allocated to this period. The village ceramics are almost exclusively Kolomoki Complicated Stamp, with "the Weeden Island series absent or nearly so." Plain ware averages 50% of the sherd counts. The ceramics of the burial mounds were predominantly of the Weeden Island series with Kolomoki Complicated Stamp vessels important. Use of the temple mounds, plaza, and special purpose mounds is probably largely within this period according to Sears.

The final period is represented by a small Lamar component. The over-all picture as seen by Sears is that of 2 successive Weeden Island components, followed by the Kolomoki culture, when all the elaborate burials were made. Sears sees connections of this Kolomoki culture with other Temple Mound cultures of the Southeast and presents a temporal alignment with the Mississippian cultures in the lower Mississippi Valley, with Hiwassee Island in Tennessee, with the Gahagan and Davis sites in the Caddo sequence, Macon Plateau in central Georgia, and with St. Johns IIa in north Florida. The Lamar component is seen as a later reoccupation of the site. This alignment of the sequence at Kolomoki is the sum and substance of this final report.

In making the alignment Sears is in direct conflict with the views of Gordon R. Willey (1949, Archaeology of the Florida Gulf Coast, *Smith. Misc., Coll.*, Vol. 113) whose sequence in the northwest coast of Florida was established before Sears began his work at Kolomoki. Sears (pp. 69-70) sees the stratigraphy at Mound Field (Willey 1949: 55-64) to be a case of inverted stratigraphy, and thinks that Wakulla Check Stamp can not be used in this aren as a good temporal indicator although he admits its utility in other parts of Florida. His conclusions are that the Kolomoki culture belongs generically to something which can be called Weeden Island but that it differs in having Kolomoki Complicated Stamp as the basic utilitarian ware while still using pottery types of the Weeden Island series in the ceremonial burial mound deposits. Sears feels these burial practices, including retainer sacrifice, are tied into a socio-religious system similar to that found among the historic Natchez. This mortuary ceremonialism probably had a distribution along the Gulf Coast Plain, and Sears suggests that it was ancestral to the Southern Cult.

The task of the reviewer is to analyze these findings in relation to the archaeology of the area as viewed by other workers and to evaluate the evidence used by Sears to reach his conclusions. It might be appropriate at this point to mention what seems to be an unfortunate lack of use of multiple working hypotheses. It must be stated for the record that Sears did set forth 2 alternative interpretations in his first field report but since that time all the data have been marshaled to uphold the single hypothesis which he favored at that time despite some obvious conflicts with other known data and interpretations.

Since chronology is the main problem at Kolomoki, one first has to review Sears's methods for setting up his temporal alignments both within the site and with the cultures in the surrounding areas. Lacking any recognized physical stratigraphy at the site, the ceramic seriation was made on the basis of assumed differences between the Weeden Island and Kolomoki complexes. In fact "a situation in which two cultures so different could occupy a site simultaneously is inconceivable to the writer" (p. 30), and yet Sears indicates (p. 99) that there is a great enough difference within the ceramics of the Kolomoki period to call one group "sacred" and the others "secular."

Let us review the origin of the distinction between these 2 complexes; to do so we must go back to the first seasonal report, in which the frontispiece shows the distribution of Kolomoki, Weeden Island, and Lamar midden deposits in a block diagram which also appears in the final report (p. 7). No numerical data of surface sherd frequencies used in the delineation of this distribution have been found in any of Sears's reports, but middens containing either one complex or the other are reported. Those with predominantly Kolomoki Complicated Stamp were called Kolomoki and those mainly with Weeden Island series ceramics were classed as Weeden Island. This division was made before the extensive burial caches in Mounds D and E had been excavated.

To return to Sears's final ceramic seriation, it was based on an arbitrary selection of various midden deposits scattered throughout the site (p. 15). The suggestion that Sears's basic chart may be inverted is a view which Sears anticipates (p. 30), perhaps because the possibility has already been stated by Fairbanks (AM. ANTIQ., Vol. 20, No. 3, p. 290). But the problem must be settled on its own merits, and the data appear to be at hand for such a solution. The closest approach to real stratigraphy at the site was in Mound D, where an almost pure midden of complicated stamp ceramics (Table II, p. 33) with 7 Weeden Island sherds was found under a burial mound which produced over 40 vessels of the Weeden Island series and one admittedly (p. 45) aberrant specimen of Kolomoki Complicated Stamp. The mound is considered by Sears to be possibly the latest mound in the Kolomoki period.

What is the interpretation available from the comparative data in the Florida area? This mound would be dated as late Weeden Island I (Willey 1949, Fig. 14) with the midden below indicating a late Santa Rosa-Swift Creek-Early Weeden Island I period when Complicated Stamp was still important in the ceramic complex. Further evidence from the area at the Fairchild's Landing site indicates a similar ceramic stratigraphy with a Kolomoki component lying *below* a Weeden Island complex (Joseph R. Caldwell, personal communcation). Thus rather than Willey having inverted stratigraphy at Mound Field, it appears to this reviewer that Sears has unfortunately reversed the Kolomoki sequence.

One problem pottery type which Sears has had to deal with is Wakulla Check Stamp, since it should appear somewhere in his sequence no matter which way it is interpreted. This type is a marker for the Weeden Island II period on the northwest Florida coast, and Ford has found a similar type (Pontchartrain Check Stamp) useful as a generally equivalent time marker in the lower Red River region. Only a handful of sherds of this type were found at Kolomoki and Sears allocates them to his Weeden Island Ib period which he equates with Weeden Island II elsewhere. This procedure would seem straightforward enough but since the Kolomoki period is placed as post-Weeden Island II then the question arises why are not there more Wakulla sherds? Sears must insist that Wakulla is not a reliable time marker in this region, although as was noted above he used the type in his definition of the Weeden Island Ib period. The virtual absence of Wakulla Check Stamp was noted from the beginning of Sears's work at the site. When it was totally absent, as it was for some time before the completion of the excavations, one could reasonably assert that the factor at work was one of location outside the type's range rather than a temporal priority for the site.

However, now some sherds of the type have been found at the site; and other sites within 20 miles of Kolomoki in the Jim Woodruff Reservoir have Wakulla sherds in significant quantities (Joseph R. Caldwell, personal communication). Thus it appears to this reviewer that the absence of the type in any sizeable numbers at Kolomoki must be taken as an indication that the Kolomoki sequence is temporally prior to Weeden Island II rather than as a reflection that "the Indians of the area were among the least trustworthy of any in Eastern North America; anything they seem to have done should be regarded with the greatest possible suspicion" (p. 81). Other new data from the Gulf coastal area tend to confirm the northwest Florida sequence; E. Bruce Trickey has described a sequence based on stratigraphy and surface collections which has Swift Creek types followed by Weeden Island and then a marked increase in Wakulla Check Stamped ("A Chronological Framework for the Mobile Bay Area," paper presented at the Southeastern Archaeological Conference, Baton Rouge, 1956 [EDITOR'S NOTE: This paper will appear in a future issue of AMERICAN ANTIQUITY]).

In making his alignment of the Kolomoki burial complex with "Mature Mississippi" culture, Sears draws on comparisons with material in the lower Mississippi valley. His comparisons (Fig. 20) are almost exclusively with Late Mississippi period vessel forms. For example

the arcaded handled vessels (Fig. 20, *D*, *F*) are characteristic of Late Nodena phase ceramics, and the late temporal position of arcaded handles was made explicit in the volume from which these illustrations were taken. The "notched added rim strip" is likewise a late feature, which is to say Late Mississippi, which Sears dates (Chart VI) as between A.D. 1500-1700, some 100 to 200 years *after* the Kolomoki period into which these influences are supposed to come.

Another method of dating used is that of trade sherds. These were not common; 2 Yokena Incised sherds and a single French Fork Incised sherd are lower Mississippi Valley types found at Kolomoki. Sears uses them to date his Weeden Island Ib period; no trade sherds from the lower valley were found in the Kolomoki complex, but he places it later. This correlation "is probably the most definite piece of [dating] evidence we have from the village area at Kolomoki." This procedure would seem to stress negative evidence too much; 3 trade sherds date the Weeden Island village deposit but the virtual absence of Wakulla Check Stamp at the site is not considered a valid dating criterion by Sears.

Another dating problem is that concerned with the mounds themselves. This kind of structure is inordinately difficult to place temporally, for the sherds in the mound fill merely set a date before which it would not have been constructed. Mound A, the large temple mound, was not extensively tested and does not appear to be conclusively dated. Mounds D and E, the elaborate burial structures, are in this reviewer's opinion dated by the Weeden Island ceramics found within them.

Speaking of dating, 2 radiocarbon dates have been obtained from the site following the report's publication: 164 B.C. ± 300 and A.D. 36 ± 300 (Crane 1956, *Science*, Vol. 124, p. 668, Samples M-50, 49). The material used for dating came from the burial mounds and appears to be in conflict with any explanation of the chronology. Something is obviously wrong, as the revised sequence as suggested in this review would not place the burial mounds, which are presumably dated by these determinations, as any earlier than A.D. 700-800 by the greatest stretch of chronology. The reviewer would suggest the following arrangement:

Red River	*N.W. Florida*	*S.W. Georgia*	*Central Georgia*
Plaquemine	Weeden Island II	Weeden Island	Macon Plateau
Coles Creek	Weeden Island I	Kolomoki	Swift Creek II
Troyville	Santa Rosa-Swift Creek		Early Swift Creek
Marksville			

The Kolomoki culture, stripped of its Weeden Island traits can be placed on a temporal equivalence with Late Swift Creek, and the plaza-mound assemblage and fancy burials placed on a Weeden Island I time level preceding the arrival of the Wakulla Check Stamp horizon marker. The temple mounds are then easily explained as being on a general Coles Creek level where the equivalence of Weeden Island Incised and French Fork Incised, a resemblance stressed by Sears elsewhere, indicates cultural influences across the Gulf Coast Plain at this time period which included mound and plaza building.

The confusion arising from an equation of Temple Mound to Mississippian is obvious. Coles Creek and Weeden Island are not Mississippian cultures ceramically. They lack bottle forms, hooded bottles, loop handled jars, and rim effigy bowls. These forms are at Macon Plateau at about this same time, but there the northern Mississippian invasion is obvious. The basic pattern which these 3 cultures, Weeden Island, Coles Creek and Macon Plateau, have in common is the temple mound-plaza complex. Granting a nebulous common origin for this complex, we can interpret the basic orientation of the cultures as being fundamentally different and contrast the Mississippi-influenced Macon Plateau intrusion with the Gulf Coast tradition-influenced Coles Creek and Weeden Island. To think of Kolomoki as "Mature Mississippi" because of its temple mound was the false step that led Sears's chronology astray. This is a remarkable circumstance, for it is Sears himself who has done much to strengthen the Gulf tradition as an interpretive mechanism.

The Final Report is a lengthy and complex piece of archaeological reasoning. It is based on a large amount of very solid excavation carefully carried out, and on an equal amount of intricate analysis and wide comparisons, as well as a reanalysis of the data presented by others. There is a welcome addition of the use of ethnographic data for interpretation of the mortuary practices uncovered at Kolomoki. In short, the work is a good synthesis of archaeological data; this reviewer's only wish is that he could agree more fully with Sears's chronological conclusions.

STEPHEN WILLIAMS
Peabody Museum
Cambridge, Mass.

The Bayou Goula Site, Iberville Parish, Louisiana. GEORGE I. QUIMBY. Fieldiana: Anthropology, Vol. 47, No. 2, Chicago Natural History Museum, Chicago, 1957. Pp. 87-170, 17 figs. $1.75.

With this publication we have the first full-scale report on the excavation of a contact-period site in this region. The Bayou Goula site is about 25 miles south of Baton Rouge on the west bank of the Mississippi River.

Location and selection of this site for excavation was the result, first, of a search of late 17th and early 18th century documentary materials. From these sources fairly good descriptions were obtained of the large Bayogoula village of that period. Secondly, an attempt was launched to locate a site showing European trade goods in the correct approximate position. Such a site was found, interestingly enough, in the environs of the present-day town of Bayou Goula. Work was begun in the second quarter of 1940 and continued, with interruptions, until July, 1941.

Actual excavation was attended with various complications, probably most restricting of which was the high water table which prevented effective work at depths greater than 4 to 5 feet.

Natural stratigraphy at Bayou Goula was as follows: About 5 feet below the surface was an apparently sterile silt layer of undetermined thickness. Atop this was an old humus level of 3 to 6 inches which was overlain by a thin midden deposit. Over this was another layer of silts with occasional cultural materials. These were attributed to intrusion from above or reworking and redeposition from below. This zone varied in depth from 3 to 4 feet. The top 9 to 12 inches, while showing disturbance of horizontal associations from plowing, were deemed a valid stratigraphic unit. Culturally, the story of Bayou Goula is told in 2 levels: the old humus level revealed a Plaquemine period occupation; the plowed zone ("top level"), Natchezan and historic.

Features of the Plaquemine occupation level included 2 flat-topped, pyramidal mounds separated by a plaza. Both evidenced 3 phases of construction, each bigger than, and overtopping, the last. No indications were found of structural remains surmounting these. Pottery recovered from the old humus level was dominantly Plaquemine with some Coles Creek types present. Natchezan wares were absent here.

The top level is of particular interest. The Natchezan occupation may be ascribed to a number of remnant and fusing tribal entities, the Bayogoula, Mugulasha (Quinipissa), Acolapissa, Tiou, Taensa, and Houma. The presence of all these groups militates against assigning specific artifact assemblages to particular tribal groups. Possibly with the aid of this report and historic documentation this goal will be accomplished at other sites. Features in the top level included several burials, 8 houses partially or completely excavated, and various refuse pits. European trade goods occurred scatteringly in each of these classes of features. The Bayou Goula house was rectangular in plan, had walls of cane construction, and in several instances had a partition wall across the width creating 2 rooms of equal area. A partly excavated palisade likewise attested the use of cane.

The author suggests that the high frequencies of Plaquemine pottery occurring in the top level are to be explained by erosion from the 2 mounds and do not represent persistence into Natchezan times. This reasoning, in common with most one-factor explanations, seems somewhat dubious. There will probably be some criticism leveled at the perpetuation of Bayou Goula Incised as a type instead of including it in the category Fatherland Incised. The report's utility, however, is much enhanced by the inclusion of a detailed description of this and several other Natchezan wares. The section on European materials seems a bit brief. Identification of crockery, earthenware, and china is not attempted. A useful appendix to the report is a chapter containing historic references to some of the material traits of the tribes which occupied Bayou Goula.

The Bayou Goula report will prove of great value to students of lower Mississippi Valley archaeology. It is hoped that more work in this period will be forthcoming in the near future.

FREDERIC HADLEIGH-WEST
University of Alaska
College, Alaska

Alt-aztekische Gesänge. LEONHARD SCHULTZE JENA. Quellenwerke zur alten Geschichte Amerikas, aufgezeichnet in den Sprachen der Eingeborenen, Band 6, Ibero-Amerikanische Bibliothek, Berlin, and W. Kohlhammer Verlag, Stuttgart, 1957. xiv + 428 pp., 1 pl. DM 60 ($15.00).

In recent years scholars in several countries have initiated ambitious programs designed to exploit more fully the rich native language sources for the interpretation of the prehistoric cultures of Mesoamerica. The most lavish of these programs is the Danish facsimile reproduction of original manuscripts without translation in the "Corpus Codicum Americanorum Medii Aevi," the most recent of which is the *Memorial de Tecpán-Atitlán* (reviewed by Linton Satterthwaite, 1954, AM. ANTIQ., Vol. 20, No. 2, p. 181). Probably more familiar to archaeologists in the United States is the translation by Anderson and Dibble of the Nahuatl version in the Florentine Codex of Sahagún's *Historia general de las cosas de Nueva España* (see Charles Gibson, 1957, AM. ANTIQ., Vol. 22, No. 3, pp. 318-9 for a review of the latest volume).

Another notable effort to make translations of native language documents available to the scholarly world is the publication by the Ibero-Amerikanische Bibliothek in Berlin of the series "Quellenwerke zur alten Geschichte Amerikas, aufgezeichnet in den Sprachen der Eingeborenen" (Records of the Ancient History of America Written Down in the Original Native Languages). The books are handsomely printed in Stuttgart by the W. Kohlhammer Press. Each volume contains the original text, a translation with notes, and an analytical vocabulary. The analytical vocabulary is one of the outstanding features of this series; it records for the use of other workers a great deal of the lexical research which went into the translation but which is only partially preserved in the translation itself.

The previously published studies are: (1) *Die Geschichte der Königsreiche von Colhuacan und Mexico*, Walter Lehmann, 1938; (2) *Popul Vuh. Das Heilige Buch der Quiché-Indianer von Guatemala*, Schultze Jena, 1944; (3) *Sterbende Götter und christliche Heilsbotschaft*, Lehmann, 1949; (4) *Wahrsagerei, Himmelskunde und Kalender der alten Azteken*, Schultze Jena, 1950; (5) *Gliederung des alt-aztekischen Volks in Familie, Stand und Beruf*, Schultze Jena, 1952.

The present study was to have been the only complete translation of the 74 Nahuatl songs in *Cantares Mexicanos*, a much used but poorly studied anonymous manuscript in the Biblioteca Nacional in Mexico. This mid-

16th century collection of songs was published in facsimile by Peñafiel in 1899 and over the years various portions of it have been translated by Peñafiel, Brinton, Seler, Gall, and Lehmann. Schultze Jena undertook a complete new translation and study of the entire manuscript. Unfortunately before he was able to complete the projected 2-volume work he died at the age of 83 in Marburg, March 28, 1955. Gerdt Kutscher, the editor of the series, assembled all of Schultze Jena's manuscript material for publication and added a useful index of names and places. The resulting volume, *Alt-aztekische Gesänge*, consists of a brief introduction, the original Nahuatl text with German translation and explanation through the first 43 verses of the 50th song, and an analytical vocabulary. Kutscher (1957, *New World Antiquity*, Vol. 4, No. 7, pp. 99-103) has published in English an abridged version of the paper he presented at the 32nd International Congress of Americanists in Copenhagen in which he emphasizes the poetic and literary value of the songs and summarizes the rich detail of religious, historical, and ethnographic information which they contain.

It is to be hoped that Kutscher, who has undertaken the completion of several of Lehmann's unfinished studies (of Sahagún's *Colloquios y doctrina christiana* already published in Volume 3 of the "Quellenwerke," of Chimalpahin's *Memorial Breve* now in press, and of the Codex Aubin 1576 still in preparation), will find the time to continue the translation of the *Cantares Mexicanos* and thus complete Schultze Jena's only unfinished research.

RAYMOND H. THOMPSON
University of Arizona
Tucson, Ariz.

Cueva de la Candelaria. Volume I. LUÍS AVELEYRA ARROYO DE ANDA, MANUEL MALDONADO-KOERDELL, AND PABLO MARTÍNEZ DEL RÍO, with the collaboration of Ignacio Bernal and Federico Elizondo Saucedo. Memorias del Instituto Nacional de Antropología e Historia, No. 5, Secretariá de Educación Pública, Mexico, 1956. 216 pp., 102 drawings and photographs (8 in color). $10.40 (130 pesos).

This volume records a great event in the history of archaeological research by the Mexican government: the beginning of activity in the vast desert regions of northern Mexico, so long neglected in favor of the Middle American area. It is the first of 2 volumes on explorations in southwestern Coahuila, with attention centered on the remarkable mortuary cave of Candelaria in the Bolsón de las Delicias about 50 miles northeast of Torreón. Edward Palmer made some collections in this area in 1879 or 1880, and Walter W. Taylor made thorough surveys and excavations somewhat farther north in central Coahuila in the late 1930's.

In 1953 and 1954, the Dirección de Prehistoria of the Instituto Nacional de Antropología e Historia in collaboration with the State of Coahuila and the Museo de la Escuela Preparatoria of Torreón, conducted 3 expeditions to Candelaria Cave and other sites in the area. The result was a fabulous array of artifacts in perfect preservation, including large amounts of textiles of a quality totally unexpected in such an environment, and the skeletal remains of some hundreds of men, women, and children. During the third expedition, in April, 1954, Walter Taylor, Edward Jelks, and I were guests of the Dirección de Prehistoria at the Candelaria field camp.

Not only is the present volume by far the largest and most comprehensive report on any archaeological work in northern Mexico, but it marks a milestone in attractive format, clear illustrations, and comparative studies for publications dealing with any of the desert regions of America. Many of the most interesting artifacts are reproduced full size; the color plates are particularly attractive.

The opening chapters, by Martínez del Río and Elizondo, recount the discovery and exploration of Candelaria Cave, previous explorations in the region, and published works on the archaeology of northern Mexico. Maldonado-Koerdell follows with a chapter on the geography, vegetation, and geology of the "Comarca Lagunera" in southwestern Coahuila and adjacent Durango. The well-known Laguna Mayrán was once a large shallow lake without exterior drainage, fed by the Río Nazas from the west and Río Aguanaval from the south. In Spanish colonial times, the area embraced by the present cities of Torreón, San Pedro de las Colonias, and Parras was and still is regarded as a great agricultural oasis. Now, however, irrigation has deprived the Laguna Mayrán of most of its water. The Bolsón de las Delicias, a separate sink to the north, is now totally desert with few inhabitants, although its pre-Columbian population may have been denser, for the cave remains indicate a technologically skilled population if not a numerous one.

The cultural material is described and discussed by Aveleyra together with many citations of comparable material from much of "Aridamerica" as far north as the caves of southeastern Oregon. Interestingly, there is little in common with Taylor's cave material from central Coahuila. The classes of material treated by Aveleyra include those of chipped stone, bone, antler, shell, and wood from Candelaria Cave and the related but apparently older Paila Cave near Parras. Among the most interesting artifacts are a series of chipped stone knives with triangular to leaf-shaped blades set with resin in wooden handles. They are instructive in the perennial problem of how to distinguish biface knives from unnotched or "stemless" projectile points.

Other objects include: small, curved and hafted end scrapers (used to hollow out gourds?); awls, punches, and scrapers of bone and antler; "ceremonial" sets of antlers; innumerable beads of bone, stone, and shell, many on their original strings and alternated in attractive designs; shell pendants; "flowers" (rattles?) of shell and bone discs bound into clusters; shafts and foreshafts of atlatl darts and arrows; bows (some complete) and pieces of atlatls; curved "rabbit clubs" with incised lines; digging sticks; simple oval back cradles; and so on.

It must be emphasized that the first volume treats only a part of this remarkable material. Volume 2 will include exhaustive studies of the unique Candelaria textiles, which reflect an almost unbelievable mastery of complicated techniques, by Irmgard W. Johnson; the basketry, sandals, and matting by Elaine Bluhm; special matting techniques by Lilia Trejo de Aveleyra; bird traps by Wenceslao Rodrigues; the human skeletal remains by Arturo Romano Pacheco; osteopathology of the Candelaria population by Eusebio Dávalos Hurtado; and the dentition by Andreë Burg.

Candelaria Cave was never an occupation site, for the problem of getting into it was much too formidable. In fact, it has not as yet been decided how the aborigines were able to get into it to dispose of their dead. When Taylor, Jelks, and I visited the Mexican archaeological camp in the spring of 1954, a winch had been set up over the mouth of the cavern which is only about a yard across, and men were let down on a rope ladder about 35 feet long. The "floor" consisted of several huge, sharp-edged rocks jammed together at odd angles, as did the "roof." It was thought at first that the Indians merely dropped burial bundles and offerings through the small mouth and that these split open on hitting the sharp rocks below. However, when the loose material had been collected it was seen that many other burial bundles and offerings had been carefully placed in layers in crevices where they could not have fallen. A search for another entrance proved unsuccessful; yet not a scrap of rope or ladder material heavy enough for a man to be lowered from the surface opening could be found. The cave was discovered originally by guano hunters who had seen bats using the surface entrance.

Although the age of the Candelaria materials remains in doubt the presence of small "arrow" points and 2 potsherds suggests that it probably dates within the Christian era. Contrary to the authors, I do not feel that the sherds have any particular connection with Indian pottery of the colonial period in the Laguna Mayrán region. Although *coas* which are described as *bastones de plantar* (planting sticks) were found, no agricultural remains other than gourds were located, and these, if domesticated, may have been carried from elsewhere. Following an analysis of these gourds and their cloisonné decoration by Volney H. Jones, Aveleyra provides an invaluable study of the cloisonné technique in Mexico and the Southwest United States.

It should be pointed out the Martínez del Río has published a good résumé of the first 2 Candelaria expeditions in English (1953, *Bull. Texas Archeol. Soc.*, Vol. 24).

The Dirección de Prehistoria deserves great credit for so successfully initiating its program of field work in northern Mexico. We all look forward to Volume 2.

ALEX D. KRIEGER
Municipal Museum
Riverside, Calif.

Maya Art and Civilization. Revised and enlarged with added illustrations. An illustrated excursion into Pre-Columbian America. HERBERT JOSEPH SPINDEN. Falcon's Wing Press, Indian Hills (Colorado), 1957. xliii + 432 pp., frontis., 372 figs., 100 pls. $10.00.

American archaeology is fortunate in having a republication of two of Spinden's most influential works, one out of print for many years. Part I consists of *A Study of Maya Art*, which first appeared, as a Peabody Museum of Harvard memoir, in 1913. Part II follows the third (1928) edition of *Ancient Civilizations of Mexico and Central America* — the American Museum of Natural History handbook which, with only minor revisions, goes back to 1917. New portions consist of a foreword and epilogue, plus additional illustrations. It is a tribute to Spinden's original contributions that they contain so much which is pertinent to problems and research of the present day.

Spinden's memoir has long served as the only comprehensive treatment of Maya art. Even after the publication of Proskouriakoff's *A Study of Classic Maya Sculpture* (1950), his work maintains its unique value. This is essentially because of his insights into a large variety of problems not considered by Proskouriakoff. Spinden's consideration is not limited to sculpture but embraces a wide range of media, architecture and the various minor arts being discussed at considerable length. Moreover, while Proskouriakoff's approach is a stylistic one — brilliantly so — Spinden, in addition to an excellent stylistic treatment, gives a penetrating discussion of the subject matter of Maya art.

A Study of Maya Art is characterized not only by its breadth of scope but by the way in which it has foreshadowed the specific findings of later years. To a striking degree, it seems that whatever the problem in the field of Maya theocratic art, Spinden has had something worth while to say along this line. Such has been the reviewer's experience, in working with the water lily, water, and captive figure motifs in Maya art. And Proskouriakoff acknowledges the way in which her systematic analysis of progressive changes in the representation of the human figure was based upon Spinden's studies. It may also be noted that the militaristic scenes found several years ago in the Bonampak murals would not have elicited such surprise if prevailing opinion had conformed to Spinden's early interpretations, rather than to a view that Classic Maya culture was peacefully oriented.

A particularly strong part of Spinden's treatment of Maya art is his discussion of the processes of simplification, elaboration, elimination, and substitution (pp. 38-46). The working of these principles is richly documented, as in the consideration of the mask panel in architecture (pp. 118-24). These passages have long impressed the reviewer as a useful springboard to the general study of the convergence, elaboration, and reduction of traditions within a single cultural setting.

Spinden's compact handbook on Middle America, Part II of the present volume, has remained a popular text due to its exceptionally lucid treatment. After a

favorable initial reception, however, a number of the views advanced therein met considerable opposition. It is not appropriate here to review the present shortcomings of a book written 40 years ago. Instead, mention will be made of certain of Spinden's ideas, once held to be outmoded, which in the light of more recent years again appear to have much in their favor. The most striking example of this is the support won by radiocarbon datings for a 12.9.0.0.0 correlation, such as that advanced by Spinden. Spinden's placing the domestication of maize somewhere in the Mexican highlands might also be cited. For a time the search for the origin of maize turned to South America. However, radiocarbon dates for maize on the northern periphery of higher culture — Bat Cave and the La Perra horizon of Tamaulipas, which are strikingly early as compared to the known beginnings of maize agriculture in Peru — have recently strengthened the possibility that maize had its origin in Mesoamerica. Also to be mentioned is Spinden's "Archaic hypothesis." Justly, it has been subjected to various criticisms, though a major counter-suggestion, the "Q-complex," has in turn passed out of vogue. In more recent years, a set of ceramic resemblances has been detailed in such horizons as Chavín, Playa de los Muertos, and Tlatilco, serving again to link South and Middle America on a Formative level. To be sure, the methodology behind these correlations involves the recognition of ceramic complexes and the use of stratigraphy, thus differing from the generalized conceptual resemblances noted by Spinden. However, the ultimate theoretical implications may not be greatly different.

Photo-offset reproductions in the present volume vary in quality, line drawings being excellent but some loss of detail occurring in the plates. Outstanding among the new illustrations are detailed drawings of certain Classic Maya sculptures. Their captions, unfortunately, fail to designate the precise monuments. (Plate L, *a*, is from Stela 7, Piedras Negras; LI, *a*, Stela 10, Yaxchilán; LI, *b*, Lintel 39, Yaxchilán; LI, *c*, Lintel 38, Yaxchilán; LVIII, Lintel 26, Yaxchilán; LIX, *a*, Lintel 17, Yaxchilán; and LXI, Stela 11, Yaxchilán.)

In spite of added illustrations and over 30 pages of new text, the major usefulness of the volume lies in the fact that it makes Spinden's earlier works more accessible. The author's foreword and epilogue deal mainly with calendrics. The discussion of "Maya Dynamic Dating and the Fallacy of Time" suffers from the lack of a straightforward presentation such as helped to make Spinden's early writings outstanding. Interesting problems are touched upon, but any significant contributions largely remain obscure. The value to the general reader would have been significantly enhanced had the book included a survey of recent developments in the art and archaeology of the area, or at least a bibliographic guide to such developments.

ROBERT L. RANDS
University of Mississippi
University, Miss.

Tumaco (Notas Arqueológicas). JULIO CÉSAR CUBILLOS. Ministerio de Educación, Departamento de Extensión Cultural, Bogota, 1955. 145 pp., 26 figs., 2 pls., 17 charts, 3 maps.

This well-written and well-illustrated volume reports the results of the first series of stratigraphic excavations to be carried out in the archaeological deposits of the southern Pacific coast of Colombia. The material involved belongs to that cultural manifestation variously referred to as Atacames, Tumaco, La Tolita, or Esmeraldas which, for those who have studied it, appears to exhibit a certain amount of Mesoamerican influence.

The locale of these excavations is the immediate region of Monte Alto, located south of Tumaco and almost directly on the border between Colombia and Ecuador. Here, 10 sites, all within the radius of 1 km., were tested by stratigraphic trenching of rubbish deposits. The result obtained from 6 of these sites forms the bulk of this monograph, the remainder of it consisting of compactly written sections on the history and geography of the Tumaco region.

In studying the ceramics from the 6 sites, no attempt has been made to set up pottery types. Instead, such aspects as paste, finish, decoration, form, and specialized clay artifacts such as graters and figurines are described separately. The range of variation within each category, and its relation to stratigraphic levels, is noted.

It is obvious, as Cubillos states, that not only do the 6 sites pertain to the same culture, but the stratigraphic results show that through the time represented by the trenches there has been no change sufficient to indicate the substitution of one cultural tradition for another. Cubillos does note, however, a slight recession of cultural activity in the lower middle levels of his trenches which, he suggests, may be due to a temporary depopulation of the area. Earlier ceramic traditions are found to continue into later horizons, though with a slight change in the popularity of certain techniques and forms. At the same time, however, new vessel forms (including fragments from 2 comales) and artifact types occur. Most important of the new ceramic items are flat and bowl-shaped graters and one spindle whorl, while architecturally the appearance of artificial platform mounds is significant. Figurines, sparse in the early period, reach a high degree of artistic development in the late period and, coincidental with the appearance of the figurine mold, become sufficiently popular to hazard the guess that a figurine cult has come to exist. Whereas ring-based vessels occur from bottom to top in the trenches, in the late period tall annular bases of a variety of shapes become common. However, both solid and hollow tripod feet appear always to have been more popular than annular supports and they increase in number and variety in the top levels of the deposits.

One stone celt and 4 eared axes were found in the late period. They are so few, however, that their lack of occurrence in the lower levels does not justify presuming they do not occur in the earlier period. Although no manos or metates were found in the excavations, Cubillos

reports their existence in this culture and I can verify this to the extent of having seen them at the culturally comparable site of La Tolita in Ecuador. However, Cubillos' interpretation of their relative scarcity in the late period as being due to the increased popularity of ceramic graters for the mechanical disintegration of food stuffs, may give us only part of the answer. Graters are common throughout the Amazon basin where they are used for grating manioc, especially the bitter variety. The sudden appearance of graters in fair quantity in the late period may well reflect, if not the introduction of bitter manioc to this region, at least an increased use of manioc and a lessening dependence upon maize. That bitter manioc does not occur in this region today does not nullify the possibility that it was introduced, possibly along with sweet manioc, but later discarded in favor of the sweet variety.

Although making no point by point comparison, Cubillos sees his Tumaco culture as ultimately derived from Mesoamerica and, more specifically, feels that closest comparisons are to be found with the Upper Tres Zapotes horizon of southern Vera Cruz, Mexico. To this reviewer, any attempt to link this Tumaco (alias Atacames, La Tolita) culture with a specific site or culture in Mesoamerica is almost certainly doomed from the beginning. This is not to say categorically that Mesoamerican influences are not present but they are, for the most part, too generalized or too diffuse a nature in Mesoamerica to attempt to specify their precise point of origin. In fact, it is quite possible that certain traits long held to be indigenous to Mesoamerica, and therefore regarded as evidence of influence from that area when found elsewhere, may be of South American origin. Ethnographically, for example, the grater and baking griddle, or comal, form part of the bitter manioc artifact complex with a wide distribution in the Amazon which may very well have considerable time depth. In Mexico the *molcajete* and comal are relatively late cultural arrivals and, rather significantly, arrive on the scene almost simultaneously, as if, perhaps, they had been originally introduced into the region with the northward spread of manioc in the tropical lowlands. That the molcajete is a bowl-shaped grater is not as strong a point against its derivation from the manioc grater as one might suppose, for bowl-shaped graters were the most common form in Cubillos' excavation and they have been unearthed both in Ecuador and Peru. Even the clay spindle whorl shows up in much earlier levels in Peru than it does in Mesoamerica where it makes its appearance in the Esperanza-Teotihuacán III horizon, but does not become common until Tula-Mazapan times and later. On the other hand, as far as can be gathered, the figurine cult appears to have had its beginnings in Mesoamerica.

What makes the problem difficult, besides the rather general and diffuse nature of the comparable material, is that ocean voyages between northwestern South America and Mesoamerica must be accepted as a possibility, and where salt water travel is feasible the geographic range of possible cultural contact covers a tremendous length of coastline occupied by a variety of cultures. However, the problems are not insurmountable and their solution will arrive with further careful excavations, especially along the northwest coast of South America. In this respect Cubillos has made an excellent start and is to be congratulated not only for a fine job of reporting and analysis but also for putting up with the difficult field conditions inherent in working in one of the rainiest regions of the tropical world.

EDWIN N. FERDON, JR.
Museum of New Mexico
Santa Fe, N.M.

Peru. G. H. S. BUSHNELL. Frederick A. Praeger, New York, 1957. 207 pp., 11 figs., 71 pls., 1 map. $5.00.

A new series has been started in Great Britain called *Ancient Peoples and Places*, edited by Glyn Daniel. Bushnell's *Peru* is the first volume, with other titles in preparation or in press covering such subjects as *The Scythians*, *Ancient China*, *The Vikings*, *The Phoenicians*, and *The Celts*. Daniel designed the series to "bring to life a specific people or place in the ancient world" for the nonspecialist archaeologist and the "ordinary interested reader." Bushnell's volume fits this purpose fairly well.

Peru is arranged according to the developmental-stage terminology used first in the Virú Valley Project and Chiclín Conference of 1946 and later modified slightly by the 1947 meeting in New York on "A Reappraisal of Peruvian Archaeology." Defining "Ancient Peru" as the cultural area of the Central Andes from mid-Ecuador to Bolivia and northern Chile, Bushnell wrote 8 chapters: Introduction, The Early Hunters, The Early Farmers, The Formative Period, The Classic Period, The Expansionist Period, The City Builder Period, The Imperialist Period, followed by a brief, but good, bibliography and an explanation of the plates. A simple time-and-period chart uses the current terminology and a series of dates acceptable to the majority.

The plates are absolutely marvelous. Both the photographers and the printer should be highly complimented. Very few line drawings are scattered throughout the text and usually these are of pottery. Considering the choice of illustrations as a whole, they are typical and illustrate the periods and art styles well, but there are too many pots and too few other objects. Carved bone, shell and stone, mosaics, textiles, and even metal are slighted, so that the layman reader may get a false impression of the total material culture of the ancient Peruvians. In an area where good preservation gives such a variety of objects, this restricted selection is misleading.

Wide margins of the text carry the plate, figure, and bibliographic references, as well as an occasional subtitle to a paragraph. This arrangement unclutters the text, and calls the reader's attention to the items.

The text is scientifically accurate except for a few minor points and one gross error. "Life in general was harder in the mountains than it was on the coast, and adaptation to the rigours of cold and altitude must have

led to the selection of a hardy race, which may explain why, at two periods in Peruvian pre-history, mountain peoples invaded and subjugated the highly organized dwellers of the coast" (p. 16). This is biologically unsound and hardly in line with our knowledge of the evolution of culture in the world, or even with what the Spanish chroniclers told about the Inca armies and altitude adaptation. Other factors are needed to explain the expansion of the Tiahuanaco and the Inca; tough life in the cold at high altitude won't do it. For a popular book it is unfortunate that Bushnell did not consult physical anthropologists or their works, such as the lifetime research and publications of Carlos Monge on high and low altitude adaptation, before postulating such a theory.

The book will be very useful for the professional archaeologist not specialized in Peru, for students in beginning classes in anthropology, as well as for the interested layman.

CLIFFORD EVANS
United States National Museum
Washington, D.C.

NOTICE

The 33rd INTERNATIONAL CONGRESS OF AMERICANISTS will be held in San José, Costa Rica, from July 20 to 27, 1958. One of the important symposia will deal with the regions lying between the Mesoamerican and the Andean cultures; papers are expected from Carl O. Sauer, Paul Kirchhoff, Morris Swadesh, Juan Comas, Pedro Bosch-Gimpera, Gerardo Reichel-Dolmatoff, S. K. Lothrop, Irving Rouse, Gordon R. Willey, and Robert Heine-Geldern. There will also be general archaeological sessions for the presentation of papers on other topics. Those who wish to register as members of the Congress ($10.00, which includes a copy of the published proceedings) should immediately write to the Treasurer, Carlos Balser S., Museo Nacional, Apartado 749, San José, Costa Rica. All hotel arrangements are being made through the Instituto Nacional de Turismo, San José. Other information about the Congress can be obtained from the office of its President, Doris Stone, Museo Nacional, San José, Costa Rica.

ANNOUNCEMENT OF ANNUAL MEETING

The 23rd Annual Meeting of the Society for American Archaeology will be held on May 1, 2 and 3, 1958, at the University of Oklahoma, Norman, Oklahoma, in conjunction with the annual meeting of the Central States Anthropological Association.

Titles of papers to be presented at this meeting and brief abstracts must reach the Program Chairman before March 1, 1958. Send titles and abstracts to Robert E. Bell, Department of Anthropology, University of Oklahoma, Norman, Oklahoma.

A program and room reservation blank will be mailed to the membership. Inexpensive accommodations will be provided by the University.

NOTES AND NEWS

EDITED BY CLEMENT W. MEIGHAN

GENERAL

During the 5th International Congress of Anthropological and Ethnological Sciences held in Philadelphia, September, 1956, a group of interested people held a meeting to organize the American Branch of the Far-Eastern Prehistory Association. The major purpose of the organization is to provide a channel of communication for all people working in or interested in the prehistory of some area or areas in the Far East. A second meeting was held at Santa Monica in December, 1956, in conjunction with the American Anthropological Association meeting. The third meeting was held at Boston in April, 1957, in conjunction with the meeting of the Association for Asian Studies. Richard K. Beardsley of the Department of Anthropology, University of Michigan, is President, and Wilhelm G. Solheim II, Department of Anthropology, University of Arizona, Tucson, is Secretary-Treasurer.

The semiannual Bulletin, *Asian Perspectives*, put out by the American Branch has now appeared. It contains news and bibliography by subareas within the Far East, from Northeast Asia to Australia and Oceania. The yearly dues of $1.00 include a subscription to the Bulletin. Anyone interested in joining should write Solheim.

ARCTIC

ALASKA. John M. Campbell of Yale University has returned from his second season of work in Anaktuvuk Pass where, with Nunamiut Eskimo help, he excavated portions of the site on the west bank of Contact Creek. Approximately 1500 addtiional artifacts were procured, and they confirm Campbell's original diagnosis that the culture represented in this site is not clearly linked with any complexes currently known in the American Arctic. A significant component in the inventory continues to be a type of leaf-shaped projectile point with parallel oblique flaking and diamond-shaped cross section. Most of the stone implements are of chert or flint, but 2% to 3% were manufactured from obsidian, a material not known to occur in arctic Alaska. Bone artifacts include projectile points, needles, and other as yet unidentified objects. No signs of permanent habitation could be observed, and it is presumed that temporary shelters were erected on the surface. Further reconnaissance in the area of the pass led to the discovery of several historic and probably late prehistoric Eskimo sites. One other locale may contain material similar to the strange complex mentioned above.

NORTHWEST TERRITORIES. A brief report from Jorgen Meldgaard of the Danish National Museum indicates that he was successful in obtaining additional valuable data from Igloolik Island, off Melville Peninsula. Despite unusually bad weather conditions around Fury and Hecla Strait, which at one time kept the party and its small whale boat locked in the sea ice for 12 days, Meldgaard was able to fill in certain gaps in the pre-Dorset and Dorset sequence which occurs on the raised beaches of Igloolik. He now has a representative series of artifacts, including bone implements, and also house types from various beach levels which extend from 54 m. down to 23 m. These represent pre-Dorset occupations, in near contact with Dorset culture, characteristic of the lower strand lines at 22 m. and 8 m.

Assembled by ELMER HARP, JR.

WEST COAST AND GREAT BASIN

NATIONAL PARK SERVICE. Adan E. Treganza excavated 4 sites in Trinity County, California, but found little cultural material, even though there were surface indications in the form of house pits and dark soil. In addition, damage to archaeological sites by construction operations in the Trinity Reservoir area was assessed by Treganza, who has now started excavation of a historic Indian village site in Coyote Reservoir, Russian River, near Ukiah, California.

Regional Archaeologist Schumacher completed a study, made at the request of the Wasco County-Dalles City Museum Commission, on the practicability and cost of a proposed Museum of Natural History to display natural, archaeological, and historical materials from the area inundated by the Dalles Reservoir on the Columbia River; these will include material excavated by the universities of Washington and Oregon and some of the petroglyphs recovered by the Corps of Engineers and the Museum Commission from Petroglyph Canyon.

Schumacher and Albert Elsasser (University of California Archaeological Survey) made a site survey during August of the Stampede Valley, Little Truckee River, Prosser and Alder creeks, and the East Fork of the Carson River, areas to be flooded in the Bureau of Reclamation's Washoe Project. On the basis of this survey the University of California expects to sample 3 or 4 sites to check their relationship to the Martis Valley complex.

The University of California at Los Angeles will excavate this winter, for the National Park Service, a site which will be inundated by the proposed Terminus Reservoir on the Kaweah River, Tulare County, California. This is the same area excavated by Franklin Fenenga in 1950 (AM. ANTIQ., Vol. 17, No. 4).

GREAT BASIN CONFERENCE. The fourth Great Basin Archaeological Conference was held at San Francisco State College, August 26-27, under the chairmanship of Adan Treganza. Sessions were devoted to Great Basin peripheral relationships and Great Basin chronology and terminology.

Prior to the conference, a 4-day seminar dealing with the subject, "The Desert West: A Trial Correlation of Culture and Chronology," was held at the University of California campus. Jesse Jennings served as chairman of the session. At the conclusion of the discussions, each

participant prepared a chart of the cultural chronology of his region of specialization. The individual chronologies were combined in a master chart which was presented and discussed at the final session of the Great Basin Archaeological Conference. Richard D. Daugherty, State College of Washington, was elected chairman of the Great Basin Conference for 1958.

CALIFORNIA. J. A. Bennyhoff has received a research grant from the University of California Patent Board Fund to work on the chronology of the Central Valley of California. As part of the larger program for this region, R. F. Heizer recently obtained 2 radiocarbon dates, one from an Early Horizon site, SJo-68, of 4100 ± 250, and one from a Late Horizon site, Sac-6, of 620 ± 200. Both of these dates confirm previous determinations from cultural and other evidence.

G. L. Grosscup, under grants from the University of California and the American Philosophical Society, visited the Museum of the American Indian, Heye Foundation, to record previously undescribed material from Lovelock Cave, Nevada, collected in 1924.

Louis J. Payen and Arthur Payen are excavating sections of a very extensive Late Horizon site, the Scott Mound, on the Deer Creek drainage 15 miles east of Sacramento. The beads, ornaments, projectile points, and tubular steatite pipes found provide an excellent sample of protohistoric material.

William Olsen, Sacramento State College, has salvaged specimens and burials from the Rio Oso site on the Feather River a few miles south of Marysville. This previously untouched mound was wantonly vandalized by individuals using shovels and a bulldozer, an extreme example of purposeful destruction of an archaeological site. Remains of about 32 burials were recovered by Olsen. The mound is of special inteerst because it appears to have manifestations of the late Middle Horizon, and Phase 1 of the Late Horizon of central California.

The California State Division of Beaches and Parks has entered into an agreement wtih the California State Division of Highways for the salvage of sites in danger of destruction by Federal-Aid Highway construction. Coordinating the program are Jack R. Dyson of the History Section and Francis A. Riddell, Curator, State Indian Museum. The first survey was made north of Shasta Lake to a point 2 miles north of Weed,Siskiyou County, a distance of about 40 miles. No major sites were encountered. Donald P. Jewell, instructor at the American River Junior College, Del Paso Heights, made the survey with the aid of a student, James Hastings. Other surveys include large sections of Highway 40 north of Sacramento to the Nevada state line. A survey of the 20-mile Sierraville-Vinton section of the state highway, Sierra County, located 4 sites through which the highway already passes; possible excavation is indicated for two.

Under the direction of Alex Krieger, Federal-Aid Highway projects in Riverside and San Bernardino counties are being surveyed for sites by Antonio A. Andretta. William J. Wallace and Clement W. Meighan are implementing surveys on the rights-of-way of the proposed Federal-Aid Highways in the greater Los Angeles area. Norman E. Gabel and William M. Harrison also are cooperating with the Division of Beaches and Parks to locate sites endangered by Federal-Aid Highway construction in the Santa Barbara region. Austen D. Warburton, chairman, Archaeological and Historical Research Committee, University of Santa Clara, is making a survey of sites which may be damanged by highway construction in Alameda, San Mateo, San Francisco, Santa Cruz, and Santa Clara counties. A one-month salvage excavation under William M. Harrison of an Oak Grove site in El Capitan Beach State Park, Santa Barbara County, is already completed.

Francis A. Riddell is continuing occasional excavations at the Karlo site in Lassen County. He has found several burials and a number of specimens attributable to the Early Lovelock period. In addition a site survey for Lassen County is being continued on weekends by Riddell with the assistance of E. B. George.

Mr. and Mrs. Harry S. Riddell, Jr., continue with their weekend archaeological field research in the Owens Valley region of Inyo County. They have recently recorded several rock shelters and a number of surface sites.

Robert Ascher of the University of California at Los Angeles supervised additional excavation of the Zuma Beach site previously reported by Peck. This site, a few miles north of Los Angeles, is one of the old west coast sites related to Topanga, Cochise, and similar cultures. The new collections include 8 burials — secondary and dorsal and ventral extended — which add much to the previously little-known mortuary complex of the site.

William Wallace of the University of Southern California reports that an archaeological survey was conducted along the San Diego Freeway right-of-way from north of San Juan Capistrano to San Clemete. Nine small archaeological sites and an adobe house of historical interest (already smashed by bulldozers) were found in the 10-mile stretch. None of the sites merit extensive investigation; five are of some interest, however, as they represent a complex characterized by the use of milling and hand-stones, perhaps analogous to that found elsewhere in the coastal region of southern California.

The anthropology department of Sacramento State College completed its first summer field session in the High Sierra under the direction of B. A. Arnold and assistants Norman Wilson and William Olsen. Twenty-six sites were recorded in an intensive survey carried out in the lower part of Martis Valley, elevation 5700 to 6000 feet, north of Lake Tahoe and southeast of Truckee. Cultural remains consist largely of flakes and flaked tools of basalt; grinding slabs and hand-stones occur in abundance on some sites. With few exceptions, artifacts are restricted to the surface or the first few inches and there is no well-defined midden. Weathering of flake scars is apparent on most artifacts. Test excavations were carried out in 2 sites, a small rock shelter in a lava cliff and an open site with 2 to 3 feet of dark, loose, rocky midden. The rock shelter excavation yielded little cultural material, but scattered artifacts were found to a depth of 3

feet or more in the natural cave deposits; the open site was evidently a major habitation center in the valley.

NEVADA. The Eighth Lake Lahontan Expedition of the Western Speleological Institute-Nevada State Museum, sponsored in part by the National Geographic Society, excavated two of the Winnemucca Caves, under the supervision of Wilbur A. Davis. The archaeological data recorded fill an important lacuna in the prehistory of the Great Basin. Present in the cultural inventory are diagnostic traits such as the atlatl, atlatl darts, composite arrows, wooden bunts, simple hardwood points, split metapod awls, scapula saws, mountain sheep horn sickles, Catlow Twined basketry, a large Catlow Twined burial mat, a twined wallet similar to the Klamath style described by Spier, coiled basketry and trays, open-weave twined carrying baskets, Lovelock style sandals and a Fort Rock Type I sandal fragment, Lovelock Wicker, fish, rabbit and carrying nets, and wooden gaming darts. Flexed burials in basketry crypts in the caves are common. Radiocarbon dating established initial occupation of at least one cave, Fishbone, at 11,000 B.P. Stratigraphic correlation of the deposits in the caves tentatively establishes the association of early man with an extinct species of horse at about the 11,000 B.P. date.

Ruth D. Simpson of the Southwest Museum explored the Lahontan terrace system in the vicinity for open sites, with special attention to the high terraces, finding at least 3, possibly 5, open sites at the Lahontan Beach level, and several sites at lower levels.

R. F. Heizer has received a grant from the National Science Foundation for a 2-year study of the archaeology of western Nevada; M. A. Baumhoff will be his assistant. They have already analyzed the collections of the Nevada State Museum, Carson City, and will start field work in the summer of 1958. Of interest for this area is the radiocarbon age of 2690 ± 250 for remains of a cremation attributed to the Lovelock culture from the eroded surface of Site Ch-15 in the dry lakebed of Humboldt Lake.

A. B. Elsasser and J. E. Smith, during August, 1957, dug the shelter site at Cave Rock, on the eastern shore of Lake Tahoe, in Nevada, since construction of a large commercial and recreational area near the site threatened its destruction by private collectors. The excavation in a guano-laden deposit disclosed evidence of sporadic occupation, although enough projectile points were found to indicate the site is a component of the Martis complex, the earliest of the known local cultures.

OREGON. The University of Oregon carried out a 6-week field trip on the Oregon Coast in the Tillamook area, excavating a large multiple family house approximately 55 by 18 feet. There were large corner support posts and apparently auxiliary supporting posts. A few planks were preserved, probably used horizontally. Fireplaces were generally off-center; one type consisted of a saucer-shaped pit lined with clear sand, and another type was rock-lined. Most of the artifacts were of antler and bone, chiefly wedges, fragments of harpoon, pins, chisels. Most of the bone artifacts were made from the long bones of land mammals. Stone artifacts were in a minority, although some projectile points and scrapers were found.

IDAHO. Alfred W. Bowers excavated on Browns Bench in Twin Falls County during September, at an early man campsite near a large spring at 8000 feet, situated near obsidian deposits. Two cultures were identified and related to each other stratigraphically. The oldest was a Cochise-like gathering culture represented by slablike grinding tools and manos, large percussion oval-shaped blades, and crude spearpoints. This was followed by a series of hunting cultures not yet clearly defined, but representing Yuma and Pinto Basin artifacts, and probably other unidentified complexes.

WASHINGTON. Work in the past year has been concentrated largely on 2 projects in the Columbia River valley. One of these, in the Dalles area, terminated in late spring with the flooding of the reservoir, and results are now being written up by B. R. Butler, who was in charge of the field operations. At Priest Rapids on the middle Columbia, salvage work, financed by a generous allocation from the Grant County Public Utility District, was begun with excavation under the direction of Robert E. Greengo at 2 key sites. The major effort was devoted to a midden site over 2.5 m. deep. More than 2000 classifiable artifacts suggest that occupation of the site dated back from the protohistoric period for an unknown period of time. A second site, mostly historic and containing a number of large house pits, was dug under the supervision of a graduate assistant, Clayton Denman. Another aspect of the Priest Rapids project was tracing, rubbing, and photographing virtually all of the many petroglyphs in the area. While no extensive burial sites appear to have survived the vigorous efforts of relic hunters in this reach of the Columbia valley, a fair amount of data on physical anthropology may be gleaned from the better local collections. Two students are assembling available information.

About 10 miles upriver from the University's excavations, the Washington Archaeological Society dug the remaining portion of another midden site, under the supervision of Douglas Osborne.

The summer's archaeology program carried out by the State College of Washington involved 3 field projects, plus the initiation of a state-wide highway salvage program. Under a contract wtih the National Park Service, Richard D. Daugherty, with a crew of 15 students, dug 3 house pits and parts of a midden at a sizeable village site in the Ice Harbor Reservoir. This is the first large scale excavation in the lower Snake River region, and should provide information on Plateau-Great Basin relationships.

A contract between the State College of Washington and the State of Washington Department of Conservation, Division of Mines and Geology, provided funds for the establishment of a highway salvage program and 2 other field projects. The highway salvage program got underway in July, with Bruce Stallard, a graduate student

in anthropology at the State College of Washington, in charge.

Allan H. Smith and Trude Smith, State College of Washington, made a site survey under this same contract in the Kalispell Indian Territory in northeastern Washington during August, locating 30 sites, including villages with house pits, villages with mat-lodge depressions, temporary campsites, and burial sites. With additional funds provided by the State Parks and Recreation Commission, Earl Swanson of Idaho State College excavated at historic Fort Okanogan at the mouth of the Okanogan River and tested Indian sites in the Methow Valley.

BRITISH COLUMBIA. Crews from the University of British Columbia worked at 2 sites in the Fraser delta this past summer. The field work was financed by the Archaeology Club and grants from the University Committee on Research, the Koerner Foundation, and a British Columbia industrialist who wishes to remain anonymous. The first weeks were spent at a shell midden, half a mile long and 14 feet deep, in the South Ladner district, which produced barbed antler harpoons with fixed points, chipped points, ground slate knives, woodworking tools, antler carving, and stone sculpture indicating a component of the Marpole focus. One of the 9 burials contained the skeletons of 2 mink, 2 predatory birds (owls?), and a composite ornament consisting of a large crescent of native copper (9.5 inches wide) and more than 80 dentalium shells. The rest of the summer was spent at the Marpole site where more information was gathered on food resources, burial practices, art, and on the large house, part of which was exposed in 1955. Over 3200 artifacts were found in the course of this season's work.

A radiocarbon age of 500 to 600 years for a charcoal sample from the bottom of the Tsleax Village deposit was received from K. J. McCallum of the University of British Columbia. This suggests that the recent Coast Salish culture of the Fraser delta area began around A.D. 1400, which is very close to Borden's estimates.

During the fall or winter dates for the early occupation horizon in the Fraser Canyon site north of Yale should be received. On a joint visit to the site this spring Wm. H. Mathews of the U.B.C. Department of Geology confirmed Borden's conclusion that the sand deposit in which the site is situated was laid down when the high-water level of the Fraser was 50 feet higher than it is at present. In the course of collecting the charcoal sample, numerous chips, several side and end scrapers and one broken projectile point were found. Several charred choke-cherry pits were among the charcoal.

During June, while removing totem poles from the old Haida village of Ninstints on Anthony Island, Queen Charlotte Islands, time was taken by expedition members to make a preliminary survey of the island's archaeological resources. Wayne Suttles of the University of British Columbia and Michael Kew of the Provincial Museum discovered 4 midden sites on the small island. The largest site, Ninstints, has stratified shell and refuse over 8 feet deep. One of the sites consists of midden to a depth of 5 feet inside a deep rock cave. This is the first report of an inhabited cave on the Northwest Coast. The extent of these deposits and the fact that the largest site has a well-defined historic horizon make the island a very suitable point of departure for archaeological investigations in Haida territory.

As a further step in surveying the archaeological resources of the Gulf Islands, Wilson Duff and Michael Kew spent a week in July putting down a test pit in the Pender Island Canal site. The deposits are up to 8 feet deep and contain a considerable number of small soapstone objects of unknown use. Three such artifacts were found in the test which indicate to a possible relationship between this site and the "early maritime" site of Locarno Beach, excavated by Charles E. Borden in 1948.

Assembled by RICHARD D. DAUGHERTY

SOUTHWEST

PECOS CONFERENCE. The 1957 Pecos Conference was held at the National Park Service Southwest Archeological Research Center, Globe, Arizona, August 26 to 28. The 3-day session, characterized as usual by informal presentation of field reports and group discussions, was attended by over 100 Southwesternists. The program, organized by R. H. Thompson, Bruce Ellis, and Albert Schroeder, was under the chairmanship of Robert Lister. Field reports for the 1957 season emphasized the large amount of salvage archaeology underway in the Southwest. Three institutions, University of Utah, Museum of New Mexico, and Museum of Northern Arizona, participated in phases of the Upper Colorado River Basin Archaeological Salvage Project; another archaeological crew worked on a gas pipeline salvage propect in northeastern Arizona; and the Museum of New Mexico, the Arizona State Museum, and the Museum of Northern Arizona continued their highway salvage programs. A stock-taking session, considering the present status of archaeological and ethnological research in the Southwest, was conducted by Emil W. Haury with Florence Ellis, Stanley Stubbs, Walter Taylor, Harold S. Colton, Charles Di Peso, John Corbett, and Ignacio Bernal participating. Various members of the conference contributed to the sessions on "Critical periods in the Southwest," "Ceramic problems and terminology," and "Biological materials from excavations." Small groups discussed the following topics: "Historical documents relating to the Southwest," "The proposed Hakataya tradition," and "Archaeological societies and the amateur." An invitation was accepted to meet in 1958 at the University of New Mexico.

ARIZONA. The 12th annual University of Arizona Archaeological Field School was in session at Point of Pines on the San Carlos Apache Indian Reservation from June 14 to August 9, with 21 graduate and undergraduate students in attendance. Raymond H. Thompson was Acting Director. Work was concentrated on the Point of Pines ruin, with Elizabeth Ann Morris as assistant dig foreman. A pit house, which closely resembles those of the Nantack phase (A.D. 900-1000), suggests strong archi-

tectural continuities for the site which previously had produced no ceramic evidence of occupation earlier than A.D. 1200. Excavations were also made in sections of the pueblo where Tularosa, Mavrick Mountain, and Canyon Creek phases are represented. A small crew with Alexander Lindsay as dig foreman excavated an unusual "kiva" at a Reserve-Tularosa phase site 1 mile east of the Point of Pines Ruin. In outlining a second kiva, they found 2 jar cremations.

Watson Smith, assisted by Robert Burgh and James Gifford, spent most of the past year in Tucson continuing the study of Awatovi ceramics, at Peabody Museum West of the Pecos.

Charles Di Peso, Director of the Amerind Foundation, reports that excavation at the Davis site has been completed. Rex Gerald was in charge of the field work.

The Chicago Museum of Natural History completed the first digging season in a new territory near Vernon, Arizona, on the headwaters of the Little Colorado River. Paul S. Martin and John B. Rinaldo directed the excavation of 10 pit houses, 6 surface rooms, and a trash mound. The pit houses are somewhat different from the Pine Lawn type; and the pottery complex includes a brown ware, a polished red ware, a smudged ware, and a lino-like gray. From the surface rooms (pueblos) Snowflake Black-on-white (?) and Tularosa Black-on-white were two of the common painted types. Extensive trenching also was done in 2 prepottery sites that occurred on old beach levels of extinct lakes. Artifacts on the surface plus a few from trenches appear to fall within the Concho complex. Apparently these were campsites; no house floors were discovered.

At the Heard Museum of Anthropology and Primitive Arts in Phoenix, Thomas Cain, Director, has renovated the Hohokam room to include a diorama of a palisaded village of the 1200's. Another exhibit is being prepared to educate the digging-conscious public regarding the antiquities laws of Arizona.

Minor excavations were carried on at the Puerco ruin in Petrified Forest National Monument, Arizona, by Albert Schroeder and Philip Van Cleave of the National Park Service, clearing several more rooms to improve the display for visitors and testing in the plaza to locate a kiva. The kiva found appears to be the usual Cibola Pueblo IV rectangular type.

New Mexico. The Museum of New Mexico, Department of Highway Salvage Archaeology, directed by Stewart Peckham, excavated 2 Pueblo II sites about 30 miles west of Albuquerque. The larger of the 2 sites is a U-shaped, masonry pueblo of which the kiva and eleven of the 18 rooms were excavated. The floor plan of the kiva is typically Rio Grande in type, exhibiting the usual alignment of ventilator, ladder holes, hearth, and sipapu, together with a 4-post roof-support system. However, the kiva also resembles those from farther west in having a recess over the ventilator, 4 pilasters, and the addition of a wall niche to the alignment of floor features. In the fall, plans call for excavation of a Pueblo III great kiva, 60 feet in diameter, which will be destroyed by the realignment of Highway 66 near Ft. Wingate.

Bertha Dutton, also of the Museum of New Mexico, planned and directed the 11th annual mobile archaeological camp for Senior Girl Scouts. The route included visits to a number of the summer excavations in New Mexico and Arizona as well as tours of National Monument and Park areas. The cooperative program with the Girl Scouts terminated with this summer's activity.

Colorado. The University of Colorado Museum continued its work in the vicinity of Yellow Jacket, Colorado. The party consisted of students representing the University of Colorado, University of Maine, and Radcliffe, under the direction of Joe Ben Wheat. Excavation of the Basket Maker III village, in which 2 previous seasons have been spent, was completed. A total of 4 pit houses and 27 storage rooms comprised the village. Work was begun on a small Pueblo II-III structure. Three pit rooms, dating in Pueblo II times, and an underground passage into a structure as yet unexcavated, were found beneath the masonry structure. Two kivas and a small amphitheater-like feature built over an abandoned kiva also were excavated.

During the summer at Mesa Verde National Park a group of seasonal rangers excavated a small house site on Chapin Mesa.

Utah. In August, James Gunnerson, of the University of Utah, spent 3 weeks in further testing of the Snake Rock site, which is a large open Fremont site showing unusually deep deposits. He found 3 periods of construction and extensive midden debris. Evidently the site is rich classic Fremont, and it will probably extend the range of artifacts and architecture now recognized as typical of that culture.

Upper Colorado River Basin Archaeological Salvage Project. Reports from 2 institutions cooperating with the National Park Service on the Upper Colorado River Basin Archaeological Salvage Project have been received.

The Museum of New Mexico reports that A. E. Dittert and a crew of students continued surveys and salvage excavations in the Navajo Dam area in northwestern New Mexico. Excavations were concentrated at the damsite and in the borrow pit areas immediately upstream on the San Juan River. An additional 42 sites were located, and digging done at 3 Rosa phase units, 9 Navajo sites of the Gobernador phase, and at 3 historic homestead groups. The Rosa phase structures include a pit house, a surface structure with pit-house features, and an exposed occupation area. A cave shelter, forked stick hogans, ramadas, a leanto, and a storage cave were included in the Gobernador phase Navajo sites. The homesteads dated from 1880 to 1934 and provided information on settlement patterns, trade routes, crops, and types of architecture, as well as changes in the inventory of goods available during that period.

The University of Utah project, directed by Jesse D. Jennings, initiated work in the Glen Canyon reservoir area. Survey of the right bank tributaries of Glen Canyon

from the damsite to the Escalante River began in June. The survey party of 5, led by Robert Lister, intensively worked this difficult terrain until mid-September, and was able to explore the entire assigned territory. Over 100 sites ranging in age from Basket Maker II through Pueblo II were discovered. A small excavation party, which has tested several sites, and extensively excavated 2 others, remained in the field until late October, under the direction of Downey Raibourn and James Gunnerson.

Assembled by ROBERT H. LISTER

PLAINS

ALBERTA. A field party of 7 from the Glenbow Foundation in Calgary excavated at the Ross site, DlPd3, on the Oldman River, near Lethbridge, from mid-June to mid-August. Richard G. Forbis was in charge, with Timothy J. O'Leary and David Quapp as assistants. The site is in an eroding bank of the river. There are 3 cultural strata, all containing crude Woodland pottery. Some change in artifact styles occurs from bottom to top, but all are in the same general tradition. There are no trade goods, but Forbis feels that the site has no great antiquity. Other sites in the same area were tested. McKean and related types of points were found on the benches overlooking the river, and later point types appear in bison kills and the valley bottom. Some testing was also done in the vicinity of High River. At the end of the summer a project was planned to test a site where a Clovis point has been found, 100 miles northeast of Edmonton.

MONTANA. Thomas F. Kehoe of the Museum of the Plains Indian in Browning and Louis W. Hill, Jr., of the Hill Family Foundation, St. Paul, Minnesota, examined a number of sites along the Teton River, including 4 bison drives. This is part of a project begun in 1953, aimed at eventually producing a conclusive study of bison drives in the northwestern Plains.

SASKATCHEWAN. The recently instituted archaeological program of the Saskatchewan Museum of Natural History in Regina made significant strides in 1957. Important sites are being found and excavated, and strong support is being received from amateurs. R. W. Nero, Assistant Director of the Museum, reports the following:

The Museum excavated a stratified site in Long Creek Valley near Estevan, in the southeastern part of the province, last summer and fall. W. J. Mayer-Oakes was in charge in July and August, until he returned to teaching duties at the University of Toronto. Boyd Wettlaufer then took over. Funds were provided by the Saskatchewan Power Corporation, which is constructing a reservoir on the creek, and the Department of Natural Resources. The site is more than 8 feet deep and has 9 cultural strata separated by sterile layers. The top 2 components contain pottery which seems relatively recent. In the lower 7 strata, 2 cultural contexts were recognizable by late August: Pelican Lake (Wettlaufer, *The Mortlach Site*, 1956, pp. 54 ff.) and Plains Archaic. It is estimated that the lowest level is as old as 6000 to 4000 B.C.

A surface collection made by amateurs from a site near Moose Jaw is being studied at the Museum. The site seems related to Agate Basin, and hence may be of considerable importance. The Museum has also recently received data and artifacts, collected some 20 years ago by an amateur from a preceramic burial, tentatively referred to the Pelican Lake culture, in southwestern Saskatchewan.

Revised radiocarbon dating apparatus has been installed at the Chemistry Department of the University of Saskatchewan, and samples from a number of sites in the province are being assayed for the Museum.

WYOMING. David Gebhard of the Roswell, New Mexico, Museum, reports one of his most successful field seasons yet in western Wyoming. The 5-man party worked at 2 sites in July and part of August. The Cottonwood Creek site in the southwestern Big Horn Basin yielded relatively few artifacts, but considerable charcoal and bone in a series of fire pits. The site is located below one of the largest petroglyph sites in Wyoming. A small rock shelter was excavated for the second year, at Torrey Lake in the Wind River Mountains. A surface survey in the Rattlesnake Mountains area of southwestern Wyoming revealed a number of sites which will probably be investigated next year.

At the Glendo Reservoir on the North Platte in eastern Wyoming, William Mulloy and a University of Wyoming-National Park Service party carried on salvage excavations in sites from early June to early July.

MISSOURI BASIN. The reports below from the Dakotas and Kansas, and one above from Wyoming, are concerned with reservoir salvage in the Missouri Basin. Robert L. Stephenson, Chief of the Missouri Basin Project, Smithsonian Institution, submits this summary of salvage work in 1957 in the Basin, as of September 1: 16 parties in the field (11 Smithsonian parties and 5 parties of institutions cooperating with the National Park Service and Smithsonian); about 70 sites recorded for the first time; about 50 sites excavated and/or tested; about 150 temporary field employees hired. This coordinated effort, now in its 12th year, is certainly one of the greatest field projects in the history of North American archaeology. Most of the work is now on the Middle Missouri, where Oahe and Big Bend are the only Mainstem reservoirs not yet completed. The variety of complexes that are being worked on, many of them in multicomponent sites, makes it likely that before the last of the Middle Missouri reservoirs is full an outline history of the settlement of the area by horticulturists will be reasonably well roughed out. The earlier history, including Woodland and preceramic, is emerging more slowly, but progress is being made.

It is also worthy of note that in the reports below from South Dakota, Nebraska, and Kansas, the first good information on preceramic complexes in the eastern Plains is appearing. The gap between the eastern Archaic and the western Plains Middle Prehistoric (also variously called Intermediate Lithic, Plains Archaic, and Foragers) is at long last beginning to close.

Oahe Reservoir Area. This 250-mile-long stretch of the Middle Missouri in South and North Dakota was the scene of most of the 1957 field work. In North Dakota, Daniel J. Scheans and a party of the State Historical Society of North Dakota, cooperating with the National Park Service, tested several sites on the west side of the river near Fort Yates, from mid-June to mid-August. The rest of the work in the Oahe area was in South Dakota. Alfred Bowers and a University of Idaho-National Park Service field party excavated at the Rygh site north of Mobridge from early June to late August. Farther downstream in Potter County, a field party cosponsored by the University of South Dakota, the South Dakota Archaeological Commission, and the National Park Service, and consisting of 11 men with Wesley R. Hurt in charge and Howard Loitwood, Jr., as assistant, worked at the Rosa site, 39PO3, for 7 weeks ending August 10. They uncovered an earth lodge, a fortification ditch, and a 12-sided ceremonial lodge 75 feet in diameter. The pottery indicates affiliations with the Stanley focus, but many S-rims demonstrate strong Mandan influence from the north. Trade goods were present; estimated dates are 1750 to 1775. It had been suspected that this village was visited by Lewis and Clark in 1803, but it now seems that the village they visited was not the Rosa site but one across the river, the Four Bears site, which has a similar artifact complex.

On the west side of the river below the mouth of the Cheyenne, Waldo R. Wedel, assisted by George Metcalf, dug with a Smithsonian field party of seven from June 12 to August 17 at the Black Widow site and 2 other sites. They opened both circular and rectangular houses and a number of burials. Camping with Wedel's party was another Smithsonian party under Donald D. Hartle, which test-excavated 3 sites. At the first, 39ST11 (the Fay Tolton site), 2 houses and a number of cache pits and other features were dug. The houses were small and rectangular, with one post in the rear wall opposite the entrance, many posts evenly spaced along the side walls, and an entrance ramp. The pottery is cord-roughened and with S-shaped rims. Typology suggests that this site dates shortly after Anderson times, by Lehmer's classification. The presence of elk-antler scrapers and notched metapodial scrapers indicates that these items may have a greater time depth than was previously thought. Hartle suggests that the elk-antler scraper originated in the Northern Plains, diffused to the Central Plains, and was later reintroduced to the north. At 39ST23 (the Gillette site), apparently a protohistoric Arikara village, a ceremonial house with an altar was among the features excavated. The pottery is characteristic of the Stanley ware series, and trade goods were found. At site 39ST45 there were 2 components, one of them like 39ST11 and the other, more recent, with circular houses, "Category B" pottery, and a bastioned palisade and ditch.

Across the river on the east side, Robert L. Stephenson and a Smithsonian party of 23 men dug at the Sully site, following up preliminary testing of the year before. Of the some 400 houses in this huge site, Stephenson opened fifteen, including 2 ceremonial lodges. The houses are circular, with 2 architectural styles: (1) large, widely spaced outer posts and short entrances; (2) small, closely spaced outer posts and longer entrances. The 2 ceremonial structures were of the latter plan, 12-sided and about 80 feet in diameter. William M. Bass, staff physical anthropologist of River Basin Surveys, spent 3 weeks helping to dig some of the 65 burials that were found at Sully. Stephenson plans another season's work at this site.

Camping with Stephenson was another Smithsonian party of 5 men under Charles McNutt. They planned to map and test sites along the east side of the river, but the heavy rains of last summer produced such a dense ground cover that it was impossible to detect house depressions. Therefore McNutt excavated 2 sites, the C. B. Smith site (39SL9) and the Sully School site (39SL7). Both are on a low terrace about 5 feet above the bottoms. At the C. B. Smith site several circular houses were excavated. At the Sully School site one rectangular and 2 circular houses were partially opened. There is a fortification ditch and palisade around the latter site. Both sites have mainly plain and simple-stamped pottery, with some trailed and incised decoration; S-rims and cord impressions are rare.

Big Bend Reservoir Area. Below Oahe Dam in central South Dakota, the Big Bend area saw its first intensive field work in 1957. In June and July, a Smithsonian field party under G. Hubert Smith worked at a historic site, 39LM241, on the Lower Brule Indian Reservation. It may be a trading post of the 1840's. Materials useful for comparative purposes were obtained. From July 1 to September 1 a Smithsonian reconnaissance unit consisting of H. A. Huscher and 2 assistants was mapping and testing sites in the Big Bend area. This unit accomplished much more than can be summarized here, but a few sites are worth mentioning: 39BF229, with Woodland pottery; 39BF315, with a La Roche component overlying a deep level of rock-filled hearths; 39HU213 and 39HU238, with Monroe-Anderson and Over focus material. Huscher moved to the Oahe Reservoir for 2 weeks of reconnaissance at the end of the season.

Warren W. Caldwell and a Smithsonian party worked from June 10 to September 6 at the Black Partizan site (39LM218), a large moated village which is one of a complex group of sites clustering on the narrow neck of land at the base of the Little Bend, about 5 miles north of Lower Brule. Outside the ditch, 2 massively built circular earth lodges were dug. Simple-stamped pottery and a few trade goods suggest a date of 1700 to 1750. The fortification ditch was originally 20 feet across and 6 feet deep with walls rising abruptly from a flat floor. A heavy log palisade stood next to the inside edge of the ditch, and regularly spaced bastions projected from the fortification line. In the area inclosed by the fortification no houses were found, but there were many cache pits. La Roche-like sherds were distinctive among the mixed ceramic sample. Caldwell suspects a long-term occupation or reoccupation at this site.

A 10-man Smithsonian crew under Robert Neuman

worked near Ft. Thompson from June 13 to about October 1. Work at the Pretty Bull site (39BF12), on a low east-west terrace in the bottoms, revealed 3 components. Most recent is La Roche-like material with a probably circular earth lodge. Deeper is a thick cultural zone with Monroe-Anderson material. Deeper yet are materials of Woodland affiliations. About 3 miles east on the same terrace is site 39BF221, where midden areas with Monroe-Anderson material were dug, along wtih, unexpectedly, 2 casket burials probably dating from the early days of the Ft. Thompson agency, around 1863. Neuman also dug a low mound, 39BF223, on a high terrace overlooking the Missouri, without conclusive results.

Also working near Ft. Thompson was a Smithsonian party under William Irving, who dug at the Medicine Crow site, 39BF2, about 5 miles northwest of Ft. Thompson. The site consists of at least 40 earth lodges, all apparently circular, and 2 preceramic components on the edge of the broad 100 to 120-foot terrace of the Missouri. Work in 2 round houses and other features has produced simple-stamped and plain pottery with direct rims having flattened or rounded, tool-marked lips. There is also a considerable amount of other pottery, including members of the Stanley series, some S-rims, trailed rims, and tool-marked body sherds. There are no cord-roughened sherds. Iron, copper, and brass items are fairly common, but there are almost no glass beads. No fortifications have been found.

The discovery of preceramic components at Medicine Crow constitutes the long-awaited breakthrough into the lithic horizons of the Middle Missouri. This material was discovered in the course of testing outside the village area. Cultural evidence was found from the surface to a depth of about 5 feet, where there is a sudden transition from overlying silt to lower sand and gravel. Sherds occurred no deeper than 1 foot. From 1 to 5 feet below the surface were groups of cobbles, large rough cores, small concentrations of charcoal, and heavily mineralized bone fragments too small for field identification. There was no natural stratigraphy. Between 1 and 2 feet deep, 2 basal sections of what are tentatively identified as Duncan points were found. Irving suggests that this level may be roughly contemporaneous wtih Signal Butte I. From 2 to 5 feet deep came small percussion-flaked stemless points with straight or convex bases. At about 4.5 feet was a partially pressure-flaked, medium-sized, corner-notched point with convex base, quite different from the other specimens. U.S.G.S. geologists Digger Jones and Robert Davis are serving as consultants in interpreting the stratigraphy of the site.

NEBRASKA. For the first time, a good preceramic component has been investigated in eastern Nebraska. Marvin F. Kivett of the Nebraska State Historical Society reports that he and 6 students worked for 7 weeks at Site 25BT3 in Burt County at the eastern edge of the state, north of Omaha. There are 3 occupation levels, but all the material seems to represent a single complex. Significant items are: stone-filled hearths; points with wide, shallow side notches and often with basal grinding; side-notched plano-convex scrapers; hand-grinding stones; bone awls; bird leg-bone beads; and a fishhook. Kivett thinks the material is contemporary with Archaic complexes farther east.

Kivett also has done some highway salvage. Early in August he dug a primary burial of 2 adults in a single pit, in Red Willow County in the Republican River drainage of southwest Nebraska. With the burials were a necklace of marine snail shells, a marine conch shell ornament, a stemmed projectile point, a knife blade, and a sheet of mica. Copper salt stains on the nasal area of one of the skulls suggest a copper nose plug or part of a face mask. Kivett thinks it likely that the burial is attributable to a Hopewell variant. There are no village sites of this period known in this area, and this is a long way west for signs of Hopewell.

KANSAS. Eastern Kansas has until recent years been a relatively blank spot on the archaeological map. Now, with current work, the stratigraphic evidence for cultural sequence in the area is appearing, as is the typological evidence for relationships with complexes in better-studied neighboring areas. A field party of the University of Kansas Museum of Natural History, cooperating with the National Park Service, carried out a salvage project in June and July in the Tuttle Creek reservoir area on the lower Blue River in northeastern Kansas. Carlyle S. Smith was in charge, with Alfred Johnson as field assistant and Maria Wille as laboratory assistant. (This was the first major field project in this reservoir; there was an initial survey by Solecki and Shippee in 1952 for Smithsonian and some subsequent excavation by Cumming for Smithsonian, Hodgden for Kansas State, and Champe for Nebraska.) The reservoir contains evidence ranging from 3 Folsom points and a Plainview point, in private collections, through Intermediate Lithic, Woodland, and Nebraska cultures. Five sites were investigated in 1957, two intensively. At Site 14MH1 the plow zone yielded materials of Woodland and Central Plains complexes. Two feet below was a lithic horizon. At site 14PO4 a circular earth lodge was excavated. The pottery is of 2 varieties: Nebraska culture and Middle Mississippi. Among the Mississippi sherds is half a vessel in the form of a human head with perforated ears. Site 14MH44, which was tested, also contained a Nebraska-Middle Mississippi mixture. Two lithic sites were tested; the material was sparse and all in the plow zone.

Roscoe Wilmeth of the Kansas State Historical Society has instituted a survey of the Kansas River Valley. He is also arranging the archaeological collections at the Museum of the Society.

A Smithsonian field party under James H. Howard worked from May 15 to June 30 in the Toronto Reservoir area on the Verdigris River in southeastern Kansas, following up an earlier reconnaissance by Alfred Johnson. Extensive excavations were carried on at 2 rock shelters and 2 open sites, and 4 other sites were tested. Five cultural complexes have been identified by Howard: Archaic, Kansas City Hopewell, Plains Woodland, Aksarben, and Great Bend. The discovery of Great Bend

materials at five of the 8 sites extends eastward the known distribution of this aspect. Howard thinks also that some of the spectacular petroglyphs of this area may be attributed to the Great Bend aspect.

OKLAHOMA. The University of Oklahoma in cooperation with the National Park Service continued archaeological salvage operations at the Foss Reservoir in western Oklahoma. Robert E. Bell directed 8 weeks' excavation at 2 sites along the Washita River in Custer County, from June 13 to August 9. Both sites, the Phillips site (Cu-11) and the Mouse site (Cu-25), appear to be examples of the Custer focus, a late prehistoric bison-hunting and gardening people of the southern Plains.

James B. Schaeffer, Director of the Oklahoma Archaeological Salvage Program, has been busy with highway salvage. Relatively few sites have turned up in rights-of-way, as modern highway patterns in Oklahoma do not seem to overlap with patterns of aboriginal settlement. Shaeffer is also doing considerable salvage work in connection with agricultural and constructional activities.

Assembled by E. MOTT DAVIS

NORTHERN MISSISSIPPI VALLEY

ILLINOIS. The Illinois Archaeological Survey, which has been located at the University of Illinois for the past year or more under the direction of Elaine Bluhm, will continue under her supervision for at least the next 12 months. All institutions engaged in archaeology in this state, now or in the past, are cooperating to make this survey complete.

The Federal Highway Salvage program in archaeology is also being energetically pushed, with William Beeson employed exclusively for this purpose by the University of Illinois since May and with Southern Illinois University and the Illinois State Museum also cooperating. The University of Illinois has so far been engaged in 2 salvage operations, both in the Peoria area and neither of major scope. The largest project in which the 3 institutions will be engaged is in the Cahokia area. Although highway construction is already underway it has not as yet threatened major sites.

No major field research program was undertaken by the University this summer, but financing has been secured and plans made for work in Arizona next summer and in Illinois the following summer. The report on the Illinois River Hopewell study by the University of Illinois is now in press. Student studies of Illinois materials collected many years ago at the University are now being formulated as Masters theses, and it is hoped they will be available later as reduced summaries.

The 1957 Field Session of the Department of Anthropology and the Museum of Southern Illinois University continued work in the Cache River Valley under the direction of Howard Winters. Five rock shelters were excavated or tested in Kerr Canyon in the upper Cache Valley. One of these gave a stratified sequence, with artifacts of the Raymond and Dillinger cultures overlying a Late Archaic occupation. Limited surveys were made of adjacent areas, with several new sites being located. J. Charles Kelley, Director of the Southern Illinois University Museum, worked on problems of terrace identification in the middle Cache drainage, and has succeeded in clarifying many problems connected with these terraces.

James Gillihan has been hired by the Southern Illinois University Museum to supervise salvage archaeology in the area, and is currently working in the area of Devils Kitchen Lake. He is also conducting salvage operations on 2 small sites being destroyed by road construction, one of them Early Woodland and the other Archaic.

Melvin L. Fowler conducted the Illinois State Museum's work in southern Illinois from June 15 to August 24. First, several prehistoric sites near Gorham were examined and some trenching undertaken. Then a complete excavation was made of a Hopewellian mound on property of Edwin Weber, which is part of the well-known Twenhofel site.

At the base of the Weber Mound were 2 successive habitation levels not precisely dated but both probably within the Hopewellian continuum. Several small pits, in the upper zone, had been dug for storage, but contained only refuse, with many identifiable mammal, bird, and fish remains. There were charcoal fragments in the pits, and the siftings will be examined for other plant remains. The circular mound, 90 feet across and 3 feet high, had been built on the upper habitation zone to cover a log tomb containing 2 skeletons. A decorated pottery vessel, a copper celt, and a reel-shaped ornament of shell were found with one of the burials, an individual extended at full length. The other skeleton, without any such equipment, placed with the legs drawn up and toward one corner of the tomb, may have been a person of lesser consequence.

Other activities of the Illinois State Museum included 2 trips to a mound in Fulton County being dug by Dan Morse. The nature of the burials and accompaniments suggest the early and somewhat enigmatic Red Ochre phase of the Woodland pattern.

The numbering and recording of all prehistoric sites in Illinois was continued. During July and August Bettye Broyles made records for 1780 sites in 30 counties.

INDIANA. The Indiana Historical Society sponsored the Indiana University Field School at Angel Mounds for the 13th year during the summer of 1957, with 8 students enrolled. Work was done in 3 different parts of the village area with interesting and profitable results. Verification of a previously surmised dichotomy in house orientation as regards house location on the site was obtained.

The Highway Salvage program in Indiana, after a slow start, is progressing satisfactorily with J. C. Householder making the route surveys. The program has been expanded to include all new construction, whether with Federal Aid or not. During September 3 Woodland mounds in the Wabash River drainage were removed just ahead of road construction.

IOWA. Reynold Ruppé of the University of Iowa reports that no regular University dig was held this past summer. Two of Ruppé's students were in the field on independent projects. One is the excavation of a rockshelter in northeastern Iowa which contains Oneota material on top and Woodland material below. The earliest material seems to be Middle Woodland. The excavation was continued through the fall on weekends. The other project was a continuation of the dig started in the spring of 1956 in the Glenwood area. A Glenwood house was completely excavated and in addition, a student studied a number of collections of Glenwood material and made a brief site survey of the area.

In July Ruppé was called to Council Bluffs by the state highway department to investigate a series of burials found by excavating equipment. The site was a mass burial with 2 components, the top one a Glenwood manifestation and the lower one Woodland. There were about 50 individuals in the upper mass burial and an unknown number in the lower pits. Unfortunately most of the upper skeletons were destroyed by the machinery, but Ruppé salvaged 5 Glenwood skeletons and 4 Woodland skeletons.

MICHIGAN. Two parties from the Museum of Anthropology of the University of Michigan were in the field during the summer. J. B. Griffin, in collaboration with George I. Quimby of the Chicago Natural History Museum, conducted an archaeological survey to the north of Lake Superior. A. C. Spaulding with Dan Morse and Mark Papworth continued excavating in an Old Copper cemetery at Menominee and devoted 10 days to a survey of Isle Royale with the cooperation of the National Park Service. The chief find at the Menominee site was a deposit of burned bone, a block of obsidian, and a strand of about 200 copper beads in a red ocher lens. This feature presumably represents an Old Copper interment of about the same age as a burial discovered in 1956 and dated by radiocarbon at about 3000 or more years ago. A fluted three-quarter grooved ax came from the same area at some depth and probably was also a product of the Old Copper people. Two new sites were found on Isle Royale. The Michigan Archaeological Society has taken steps to record and preserve a petroglyph site in Sanilac County and is also working on a statewide systematic recording of sites. The highway salvage program has suffered from a few legal difficulties, but some survey work has been done.

MISSOURI. Five research projects were conducted by the University of Missouri during the summer. The 2 largest were those aided by National Park Service grants in the Table Rock and Pomme de Terre reservoir areas. Premature flooding of the Table Rock reservoir made it necessary to conduct investigations in the environs of the lake. Under the direction of Carl Chapman and Richard Marshall 14 dry shelters were investigated and a good sample of perishable materials was obtained. All the perishable material could be equated with the late or marginal Mississippi occupation of the area. Reduction of the water level in the lake this past fall permitted further investigation in the lake area. Excavation of 3 mounds and a large rock cairn and the testing of 6 terrace sites with a mechanical trench digger were accomplished in the Pomme de Terre reservoir area. Evidence was obtained making it possible to separate 2 late occupations in the area. The work was under the supervision of W. Raymond Wood and continued during the fall. A large project under a grant from the James Foundation was begun in August under the supervision of Richard Marshall. The work has centered around Maramec Springs and has produced a great deal of information about the Highland aspect and 2 earlier cultures. Research will continue until the fall of 1958.

Excavations were conducted throughout the summer at Research Cave, a University-Missouri Archaeological Society project under the supervision of J. Mett Shippee. The post-Hopewell level yielded a large quantity of perishable materials which are invaluable for interpretative purposes.

The regular summer field school, under the direction of Richard Keslin, was again held in southeastern Missouri where the problems of manufacture, use, and trade of salt in prehistoric times were investigated at saltpan sites.

OHIO. The Ohio State Museum and Ohio State University joint field session explored a prehistoric Late Woodland village site located 4½ miles south of Columbus and just east of the Scioto River. A housing development will soon destroy the site. Two long trenches revealed 7 refuse pits and a circular house pattern, 21 by 22 feet with 38 post holes. The work was under the direction of Raymond S. Baby assisted by Jack Shaffer and students from Ohio State, Ohio Wesleyan, and Miami Universities.

Later in the season the Ohio State Museum conducted salvage of Glacial Kame burials near Mt. Corey.

WISCONSIN. Work by Warren Wittry of the Wisconsin State Historical Society at the Raddatz rock shelter in central Sauk County was sponsored by the Hamilton Foundation. Wittry was there 8 weeks with a crew of 4 students. The most significant result was finding a fairly "pure" manifestation of the "side-notched" Archaic, well-delimited stratigraphically; although no copper was found, it is closely related to Old Copper.

Wittry conducted a major salvage operation in September, investigating fourteen of the 17 conical and oval mounds of the Wakanda Park Mound Group in the city of Menomonie in Dunn County. That this was done in less than 8 days was possible because of the fine cooperation of the local volunteer workers. The mounds have now been bulldozed and will be flooded next spring by a dam now nearing completion. Artifacts, other than flakes and sherds, in the fill of the mounds were scarce, but a necklace of rolled sheet-copper beads was found. The burial customs, ceremonial fireplaces, and "altars" indicate a close relationship with the Effigy Mound culture in spite of the lack of mounds of effigy shapes. This project was sponsored by the Wisconsin Archaeological Survey and the State Historical Society.

Efforts to get a modest appropriation from the Wisconsin legislature to help the highway salvage program failed. Wittry is getting copies of future construction programs and right-of-way plats from the Highway Commission and their cooperation is excellent although money to do the preliminary surveys is still lacking.

Bob Hall of the Lincoln-Tallman Museum in Janesville has been working Sundays with volunteer workers at the large Upper Mississippi village site on Carcajou Point on Lake Koskonong. Prior to his work all materials known from the site were Oneota; Hall has also found some Trappist materials.

Assembled by M. L. FOWLER

NORTHEAST

MASSACHUSETTS. Maurice Robbins reports that the Cohannet Chapter of the Massachusetts Archaeological Society continued its work on the Wapanucket site at Assawompsett Lake in Middleboro during the 1957 season. The excavations this season confirmed the theory, evolved during the 1956 season, that the site of an archaic village had been located. The village was on the north shore of Assawompsett Lake, on a level area some 30 feet above mean water level. To date, the outlines of 6 lodges have been discovered. These consist of pairs of postmolds forming a circle which, with one exception, are about 28 feet in diameter. The outside walls of these houses bypass at one point so as to form a shielded entrance-way some 6 to 8 feet long. In each instance the entrance-ways face to the north away from the lake. The floors themselves are hardly distinguishable although at certain spots the soil within the lodge is somewhat harder than elsewhere. The single exception is Floor 5, which has a diameter of more than 40 feet. Within this larger floor 2 concentric rings of postmolds were found, the inner ring having 5 small hearths placed between postmolds. During August, William A. Ritchie, New York State Museum and Science Service, with his son and some members of the Cohannet Chapter, excavated Floor 6, substantiating the earlier work in every detail.

Four cremations were found this season, located immediately to the south of Floor 1. Each consisted of small deposits of burned animal and human bones. More than one person was represented in each burial. Two of the cremations were without grave goods. Burial 2 was accompanied by a quantity of red paint, 4 gouges, a plummet, and 2 sharpening stones. Burial 3 contained a large semi-lunar knife and a sharpening stone. Some 700 stone artifacts have been found at the site. All tend to conform to an Archaic pattern. Projectile points include small triangles and eared and stemmed varieties. Among the heavier tools are semilunar knives, roller pestles, grooved adzes, gouges, plummets, notched weights, crude fleshers, and choppers. A few fragments of steatite vessels have been recovered, but no pottery or trade material has been found. The excavation of this site will be continued until the extent and number of lodge floors is determined.

NEW JERSEY. From June 24 to September 6, 1957, the New Jersey State Museum surveyed the Delaware River valley from Trenton to Port Jervis, checking known archaeological sites and examining new ones. This program was undertaken preparatory to the salvage of archaeological material threatened with destruction by anticipated flood control and highway construction projects. Ronald J. Mason directed the survey, which although seriously hampered by severe drought conditions, supplied data which should help insure against the destruction of unstudied sites. Of particular interest was the discovery of what may prove to be 2 Early or Middle Archaic stations, the first known for this region. These have produced lanceolate and stemmed projectile points, large flake end- and side-scrapers, notched pecked axes, a quartzite semilunar knife, "coup-de-poing-like" bifaces, many chips, and large quartzite cores with frequently erratic placement of striking platforms. Polished stone is completely lacking. Quartzite appears to have been a major source of tool material, and implements thus produced are remarkably similar to Greenman's material from George Lake I. One of these sites also produced a fluted point of gray chert. Provenience in the terrace structure of the Delaware Valley should provide geological confirmation of the sites' typologically early appearance.

The results of the last summer's work by the State Museum, at the Steppel Site in Morris County will soon be published by Mason in the Bulletin of the Archeological Society of New Jersey. This important site provided information bearing upon the problem of central Delaware Valley-coastal New York contacts, as well as a link with late prehistoric mortuary practices of the Delmarva Peninsula-Chesapeake Bay area to the south.

Two other studies of special importance are being pursued in New Jersey and the Delaware Valley. One is a comprehensive study of the available local skeletal material by Jacob W. Gruber of Temple University, Philadelphia. The other is Ronald J. Mason's study of fluted points and the paleo-Indian period in the Delaware Valley.

NEW YORK. During July and August, William A. Ritchie of the New York State Museum and Science Service, assisted by 6 students, conducted excavations as part of Ritchie's long-term project, the development of aboriginal settlement patterns in the Northeast and their socio-economic correlates. Two sites were intensively explored. The larger, covering some 2 acres of the German farm, Montgomery County, is the earliest large Mohawk Iroquois village known. This is a Chance horizon site. Five longhouse floors were wholly or partially exposed. These and storage pits, hearths and other features, were all within a double-walled stockade line. The largest house floor, fully uncovered, measured about 88 feet in length and 23 feet in width. It is now evident that, in the easternmost Iroquois tribe, the typical settlement pattern of the later Iroquois was already in existence on the Chance horizon of cultural development. Actual age will be attempted by radiocarbon dating.

Near Greene, Chenango County, a small village site of the Owasco culture was partially excavated on the Bates farm. A single-line, oval palisade, approximately 96 by 50 feet, was almost completely traced. House floors appeared to be circular or oval and small in size. Storage pits and hearths were numerous. This village, on which work will continue next season, will be dated by the radiocarbon method.

A site reconnaissance on the Allegany Indian Reservation, threatened with inundation by a proposed dam, was done by Ritchie and 2 assistants in early September.

Alfred K. Guthe and Marian E. White, of the Rochester Museum of Arts and Sciences, located a ditch around the Owasco village excavated on the Morrow site, near Honeoye. This ditch, dug into clay and gravel, describes a rough oval with an east-west diameter of 180 feet. It had been partially filled with wash during the site's occupation, and cultural debris occurred primarily in the upper levels. This is the second Owasco village with which a ditch has been associated. The other, the Sackett site, lies about 20 miles to the north and east of the Morrow site.

During September, 2 ossuaries were investigated by Guthe and White with the assistance of Virginia Cummings and Elizabeth Albro of the Buffalo Museum of Science. These were encountered by power machines removing sand near Clarence, Erie County. Both were approximately 5 feet in diameter and 3 feet deep. The majority of the bones appeared to have been dumped into the holes after the flesh had been removed; however the study of the remains has not been completed. No artifacts were located in the ossuaries, but an occasional potsherd in the fill indicates an early Iroquois culture.

PENNSYLVANIA. A Carnegie Museum field party under the direction of Don W. Dragoo conducted a survey and excavation program in western Pennsylvania and eastern Ohio during 1957. Nearly 100 new sites were recorded. Particular attention was given to the correlation of the location of Archaic and paleo-Indian sites with specific glacial features such as terraces, old lake beds, and moraines. The majority of the sites located were of the Archaic period. Of particular interest were items, such as steatite vessels and broad, tapered-stemmed points, indicative of the transitional cultures between the Archaic and Middle Woodland.

The Susquehannock Archaeological Society, a Chapter of the Society for Pennsylvania Archaeology, has issued its first Bulletin. Volume 1, Number 1, was issued in September, 1957 in mimeographed form.

ONTARIO. Work at the Rice Lake Serpent Mounds site in Peterborough County was continued by the Royal Ontario Museum during 9 weeks of the 1957 field season, under the direction of Richard B. Johnson. This was the second of a projected 5-year investigation of the site being conducted in cooperation with the Ontario Department of Lands and Forests and the Serpent Mounds Foundation of Peterborough. Work continued in the Serpent Mound, where 2 flexed and 4 secondary interments were encountered. A complete wolf mandible and an infant accompanied one of the dismembered burials, and a side-notched point was found with another flexed burial. Exploratory excavations in one of the 7 other smaller mounds adjoining the Serpent Mound revealed a mass grave containing primary and secondary burials of at least 16 individuals. Grave goods were lacking although some material was recovered from the shallow fill. Four test squares also were completed in shell deposits on the slope below the mounds near the shore of Rice Lake. Here, considerable pottery and other refuse was found in stratified shell. More work in the field and with the material recovered will be necessary before an adequate appraisal of the cultural affinities of this site can be made.

Assembled by A. K. GUTHE

SOUTHEAST

ALABAMA. Carl Miller reports that a survey was made of the Warrior Lock and Dam Reservoir, on the Black Warrior River, during the month of April, 1957. No archaeological remains are involved although an early Woodland site may be damaged during improvement work.

Work was resumed in Russell Cave, Jackson County, a joint Smithsonian Institution-National Geographic Society expendition, on May 1 and brought to a close in late August, at which time a level was reached 32 feet below the present floor of the cave. A small hearth containing sufficient charcoal for a radiocarbon test was uncovered on the 23 foot level. This material has been sent to the University of Michigan.

FLORIDA. C. H. Fairbanks states that the Department of Anthropology at Florida State University spent the summer in campus teaching and survey work in the northwest Florida area. A special effort was made to locate sites in the Kakulla basin. The site of Panton's store which was attacked and captured by William Augustus Bowles was located. Surface material is largely early 19th century ceramics. Indian artifacts make up a rather peculiar combination tentatively identified as Fort Walton. This material may belong to occupation of the site by Upper Creeks under Hillis Hadjo following the Creek war.

The *Florida Anthropologist* wishes to advertise that it is interested in receiving papers in southeastern anthropology and archaeology.

The Florida State Museum excavated 2 burial mounds during the summer. Sears completed the excavation of one near the mouth of the St. Johns River, built in the St. Johns Ib or Weeden Island period, and containing over 50 burials. About a dozen of these, both primary extended and secondary bundle, were in a single large tomb in the center of the mound. Others, largely secondary bundles, were distributed around the center. Artifacts were limited to a single cymbal-shaped copper ornament and a celt with the burials. A few sherds in the fill were mostly sand-tempered plain, but did include decorated Weeden Island and Swift Creek II complicated-stamped.

Another Weeden Island period mound is currently being excavated in the central Florida lake region. The mound appears to have been built in the northwest Florida Weeden Island tradition, with an east side pottery deposit. Most of the vessels and sherds, however, are St. Johns series, including a number of miniatures placed in the fill over the centrally located burials.

GEORGIA. A. R. Kelly and students completed a fourth season of exploration at Etowah in the Mound B-plaza area. A highlight of the season was uncovering a hexagonal council house, 35 feet in diameter, wtih a central hearth and a wide opening (small court) over the hearth area. This structure (No. 3) had 2 midden accumulations on the floor, separated by thin waterlaid sand derived from mound B sheet wash. The indicated period is early Wilbanks. Structure 4, on top of a large building platform and subsequent to Structure 3, is a long rectangular structure with a staggered postmold pattern and late Wilbanks midden on the floor. It is now clear that there was cultural continuity at Mound B, in terms of mound construction, architecture, and ceramic changes from the Etowah period in "saucers" beneath Structure 3 to the early Lamaroid materials accumulated on the slopes of Mound B and in the overburden deposits in the plaza.

James Brown, at the end of the season, excavated a small rock shelter on the Georgia side of Lookout Mountain. This yielded stone artifacts, limestone tempered pottery, and one finely preserved dessicated specimen of wild potato belonging to a morning glory genus, as identified by University of Georgia botanist Wilbur Duncan. The shelter on Lookout was partially walled in, and thus is the first definitive result in the survey of walled stone structures in the north Georgia-Tennessee area.

A. R. Kelly and David W. Chase excavated a 20-foot stratigraphic test block at Halloca Creek, Fort Benning Military Reservation. They confirmed the presence of good occupational levels belonging to fiber-tempered, Santa Rosa-Swift Creek, Early Swift Creek, and later Middle Woodland horizons in this vicinity. The work is being carried out under a federal permit with the collaboration of the Army, the National Park Service, and the University of Georgia.

A large village site near Monroe has been prospected, yielding surface collections of large tetrapodal supports with simple stamped and check stamped decoration, either Caldwell's Cartersville complex or a Middle Georgia Deptford equivalent. Large "bald spots" on the site offer hope of finding some early to middle Woodland houses, a rarity in Georgia surveys thus far. The site is to be further surveyed by Kelly, James H. Kellar, and students in the fall.

VIRGINIA. With the completion of the report *Archeological Explorations at Jamestown, Virginia, 1901-1957* (submitted with the recommendation that no further excavations at Jamestown be attempted for the next 50 years, or until historical research caught up with archaeological data), John L. Cotter was assigned to the Region Five Office of the National Park Service as Regional Archeologist and also as Supervising Archeologist for Eastern North America. This move closed the 3-year crash program for completing archaeological research at Colonial National Historical Park.

Comprehensive long-range planning is now under way for archaeological investigations within the area of Region Five, comprising the territory from the Potomac to Canada and the Atlantic to Lake Superior. Archaeological research is in prospect for Acadia National Park where a unique opportunity exists to examine the nearly coincident development of flora and fauna, including man, on an island swept bare by ice, which emerged from the last glaciation to provide a fascinating ecological community series. St. Croix Island, authorized as a National Monument, was the scene of the unsuccessful French settlement attempt of 1604 and will be subject to further archaeological study, based upon Wendell Hadlock's initial investigations of 1950. Archaeological work is also planned for Saratoga National Historical Park, Hopewell Village, and Mound City Group National Monument.

Within Region Five, more than a dozen reservoir areas, mostly in New England, are to be flooded in the next 3 years, and contract negotiations have been entered into with Peabody Museum of Harvard to accomplish surveys for these areas.

Assembled by W. H. SEARS

LOWLAND SOUTH AMERICA

ARGENTINA. In January and February of 1957, the Museo de La Plata conducted its annual expedition to northwest Argentina. Two field parties were sent out, one led by Eduardo Cigliano to the valley of Santa María and the other led by Alberto Rex Gonzalez to the vicinity of Andalgalá, Catamarca. The first party undertook excavations in the Yocavil valley at Rincon Chico, a settlement belonging to the final part of the Santa María sequence. In the southwest part of the valley, several important sites were discovered belonging to cultures not previously reported in the area. Sites of La Aguada and Ciénga phases of the Barreales culture were also located. Excavations were undertaken in an important Condorhausi site, composed of large agricultural enclosures among which were scattered small oval or circular houses, the floors of which were below ground level.

In the Andalgalá area, some 30 sites were recorded. An important nucleus of population showing clear-cut Incaic influence was identified in the ravines of Choya and El Potrero. A cemetery investigated on the bank of the Rio Ampacho contained urn burials of children. Unfortunately, most of the burials had been previously disturbed. In the zone of Singuil several groups of ruins were located and tested stratigraphically. East of Andalgalá, in the vicinity of Agua de Las Palomas, 17 sites were surveyed. These consist of mounds of refuse 1 to 2.5 m. high, situated around prehistoric catchment basins. These belong to a little known culture with crude pottery. Their significance lies in the fact that trade sherds of pottery types from the Condorhausi culture and the Ciénga phase of Barreales culture occur, making it possible to confirm the contemporaneity of these 2 cultures.

Also in January of 1957, the Facultad de Filosofía y Letras of the Universidad de Buenas Aires sent an expedition to Alfarcito, Department of Tilcara in the Province of Jujuy, under the direction of Ciro R. Lafón, Pedro Krapovickas, and Guillermo Madrazo. Alfarcito was studied briefly by Debenedetti in 1918, but the present expedition was able to expand his description considerably. The site consists of agricultural platforms interspersed with enclosures and dwellings of very diverse types. The water coming down from the mountains was diverted into a complex irrigation system. Several dams and remains of canals and flumes were encountered at considerable elevation. Some of the latter were constructed of stone slabs and in an excellent state of preservation. In some places, where the terrain permitted, the fields extended up the slopes to an elevation of about 4000 m. The site is believed to represent a considerable period of habitation. The termination of the sequence was established by the discovery of classic Humahuaca pottery in association with European sherds in one of the houses. One of the important finds was pottery of a highly polished gray ware hitherto unreported in the Humahuaca area, expanding the known area of distribution of this ware in northwest Argentina. Another interesting discovery was a characteristic burial pattern in which the bodies were placed in tombs lined with a few stones or slabs without any grave offerings.

The first expedition of the recently formed Instituto de Antropología de la Facultad de Filosofía y Letras, Universidad Nacional del Litoral, excavated an important site at the foot of Aconquija, south of Alamito, Department of Andalgalá, Catamarca. Students of the Instituto received field training by participating in the work. The site appears to belong to a little known early agricultural period in northwest Argentina. It consists of a series of mounds, one on the west side and the remainder on the east side of an old artificial basin. The mounds correspond to former houses with clay walls. Each wall has a series of columns 1 m. apart composed of a single row of stones. Maximum length of the houses is 17 m. The pottery associated with the site is predominantly plain; only a few sherds are polished and painted or incised. Among these are several types belonging to the Condorhausi culture and the Ciénaga phase of Barreales. Stone sculpturing is well developed, exemplified by anthropomorphic and zoomorphic figures and stone vessels.

Brazil. In July, 1957, Peter Paul Hilbert of the Instituto de Pesquisas da Amazonia, Belem, undertook survey and stratigraphic testing in the vicinity of Santarem and on the Rio Tapajós in the effort to determine the cultural sequence. Seven sites were investigated near Brasilia Legal, about 200 miles up the Tapajós. All were small, with refuse less than 30 cm. in depth. The ceramics are cauixi-tempered and light tan in color. A flat-topped rim is typical. Decoration consists of punctates of Konuri style applied to the surface or to the top of an appliqué rib around the maximum diameter of the vessel. Stone artifacts include rectangular, side-notched axes. The same complex was found at Boim, about 80 miles from the mouth of the river. Hilbert notes that the distribution of this culture coincides with the territory historically inhabited by the Maués and suggests that it may therefore be of relatively recent date.

Another area surveyed was the "altos," high table-land beginning 10 to 15 km. south of Santarem. A series of strata cuts made at several sites produced an abundance of pottery. The majority of the sherds were plainware of the Santarem type, suggesting that the impression of a high proportion of decorated pottery in the Santarem complex is the result of selective collecting. The sites are frequently very large in area, with refuse up to 1 m. in depth. The paucity of surface water suggests that wells were used in prehistoric times as they are today.

Venezuela. During February and March of 1957, José M. Cruxen, Director of the Museo de Ciencias Naturales, Caracas, and Clifford Evans and Betty J. Meggers of the Smithsonian Institution made a survey of the Río Orinoco from Puerto Ayacucho to the mouth of the Río Ventuari, of the Río Ventuari to the first falls, and of the Ríos Manapiare and Parucito to the limit of dry-season navigation. Thirty-eight sites were located, and 2 or more stratigraphic tests placed in most of them. Sites on the Orinoco were the most abundant and had the deepest refuse deposits. With increasing distance from major water courses, the sites became shallower. In only one case could village plan be detected. This was a site on the peninsula between the Orinoco and the mouth of the Río Atabapo, where a circle of refuse mounds 1.5 to 2.0 m. high surrounded a bare plaza. Two of the sites included in the survey consisted of a single granite monolith, and appear to represent part of the complex of stone alignments that has been reported from British Guiana and the Teritory of Amapá in Brazil.

This survey was undertaken because of the potential importance of the upper Orinoco and its tributaries as routes of aboriginal movement. Several large rivers drain from the highlands of Colombia and other tributaries flow from the Guianas. The Orinoco itself connects with the Río Negro and the Amazon. Superficial examination of the pottery collected indicates relationships with Colombia and the Guianas. When detailed analysis has been made of this material, as well as that collected previously by Cruxent from the upper Orinoco and the Casiquiare Canal, it should be possible to determine in detail the kind of influences that entered this region and their probable sources, as well as the relative antiquity of their appearance.

Assembled by Alberto Rex Gonzales
and Betty J. Meggers

HIGHLAND SOUTH AMERICA

Colombia. A minor landslide on the slopes of the Morro de Tulcán, a cone-shaped hill on the outskirts of the city of Popayan, has lead to the discovery of a major archaeological site which, at present, is being excavated by Julio César Cubillos of the local university. The hill was found to be covered with stone slabs and cut

(not molded) adobe bricks of different colors, forming a pyramidal structure of large dimensions. Several stairways and platforms have been cleaned and suggest that the site was a ceremonial center.

During construction work in the town of Medellín a large burial ground was exposed. Graciliano Arcila Vélez, archaeologist of the local university, reports that urn burials were found at the bottom of cylindrical shafts covered with stone slabs. Luis Duque Gómez, director of the Instituto Colombia de Antropología, has renewed his work at San Agustín, and the discovery of several new statues has been reported. A midden site has been excavated and a large amount of sherds found. José Pérez de Barradas of the University of Madrid has returned to Colombia in order to continue his study of pre-Colombian gold in the Museum of the Banco de la República.

CHILE. Jorge Iribarren of the Museo Arqueológico of La Serena reports on his survey of the Gualcuna region, north of Coquimbo province, where he explored several sites of the El Molle and Diaguita cultures. Other finds from the same region suggest a preceramic culture.

Members of the Sociedad Arqueológica de Viña del Mar excavated recently a large preceramic burial ground at Las Cenizas, near the port of Valparaiso. In the vicinity of the site a group of rocks showing cup-shaped depressions was found. The depressions contained an ocher-colored substance which was also observed in the burials.

Father Gustave Le Peige is reported to have discovered several preceramic sites at San Pedro de Atacuma which are said to be related to the Ayampitín complex. A Tiahuanacoid burial ground and remains of a hitherto unidentified culture were found in the same region. Father Le Peige has opened a private museum at San Pedro where his discoveries will be on permanent exhibit. Another archaeological museum has been inaugurated recently at Viña del Mar by the Sociedad Arqueológica of this town.

ECUADOR. Emilio Estrada reports from Guayaquil that Father Ignacio Porras Garcés has discovered a large architectural complex on the headwaters of the Napo River, at some 1500 m. altitude. Enclosures of different sizes, free standing stone columns, slab-paved streets and small stone-covered mounds are mentioned. A crude human statue with hands raised to the chin is said to resemble certain San Augustín statues. Señor Estrada has provided the means for a systematic exploration of the site.

PERU. Frédéric Engel and Edward Lanning have continued their work in coastal preceramic deposits. Several important sites located recently are the following: Valle de Culebras, 292 km. north of Lima; the littoral region south of Quebrada del León and north of the Chancay Valley, 87 km. from Lima, and northern section of the Asiaj Valley, 102 km. south of Lima. Three apparently different complexes, yet interrelated, were identified, and in the Culebras Valley an incipient ceramic culture was found to overlie the preceramic deposits. Additional explorations by Engel near Ocoña, between Huarmey and Casma, as well as near Piura and the Chira river, have lead to the discovery of several other preceramic sites. At the important ceremonial site of Las Aldas, between Culebras and Casma, a sequence of preceramic, incipient ceramic, and Chavinoid strata was established.

Toribio Mejía Xesspe, Sub-Director of the Museo Nacional de Antropología y Arqueología, assisted by Cirilo Huapaya Manco and José Casafranca, has conducted excavations in the Palpa Valley. A large number of testpits was excavated at Cerro Mollaque and 88 Nazca burials were discovered. Stratification revealed cultural materials which seem to antedate Paracas Cavernas and the outstanding features of which are: incised as well as pre- and post-firing painted decoration, primary burials, secondary urn burials for children, obsidian projectile points, vessels with braided handles, and walls constructed of straw-covered stones. Textiles of wool and cotton were discovered in the same context.

The National Museum has continued excavations at La Florida, Lima, where a Chavinoid site with Paracas associations was discovered. North of Bahía de la Independencia a Cavernas-type burial was discovered by Jorge C. Muelle, Director of the Museum.

At Chavín reconstruction work has continued under the sponsorship of the Patronato Nacional de Arqueología, and under the supervision of the Dirección de Cultura, Arqueología e Historia. The same institution is reconstructing the Incaic Puruchuco ruins at Vista Alegre, Rímac.

In August the University of San Marcos organized an expedition in collaboration with the "Comisión Fulbright de Intercambio Educativo en el Perú," with the purpose of surveying all archaeological sites endangered by government irrigation projects. In connection with this survey, Dwight Wallace (University of California) is working at Chincha; Louis M. Stumer (Yale) at Cañete, and David Kelly (Harvard) on the North Coast, mainly in Piura. Several Peruvian students of San Marcos University are accompanying the expeditions.

Seiichi Izumi of Tokyo University excavated in the Chancay Valley, at Macatón, Hacienda La Huaca, where recent cultural deposits of Tiahuanacoid and Black-on-white were located.

Assembled by G. REICHEL-DOLMATOFF

A CHECKLIST OF REGIONAL ARCHAEOLOGICAL JOURNALS

COMPILED BY DAVID A. BAERREIS AND THE ASSISTANT EDITORS

The Society for American Archaeology was founded to encourage the development of knowledge concerning New World archaeology. While its journal acts as an important vehicle of communication for the field, much important information is published in regional journals, particularly those of local societies. This checklist, first published in 1953 (Vol. 19, No. 2, pp. 208-10), has been revised on the basis of information furnished by assistant editors and other members of the Society. Like the original, it is presented in the hope that by making readily available subscription rates and appropriate local officers, these publication programs can be strengthened by additional subscriptions. No attempt has been made to include institutional series that are essentially monographic in nature or periodical publications, such as historical journals, that publish only occasional articles in archaeology.

SOUTHEAST

Early Georgia. Journal of the Society for the Preservation of Early Georgia History. Editor, Wilfred D. Logan. Vol. 1 issued as follows: Nos. 1 and 2, 1950; No. 3, 1954; No. 4, 1955. Vol. 2, No. 1 issued 1955; No. 2, 1957. Subscription included in membership dues of $3.00 per year. Applications should be sent to Wilfred D. Logan, Box 936, Macon, Ga. A newsletter of the Society for the Preservation of Early Georgia History, *As Seen From the Macon Plateau*, is published irregularly by the Society and subscription is inculded in membership dues. Vol. 1, No. 1 was published in August, 1957.

The Florida Anthropologist. Quarterly journal of the Florida Anthropological Society, initiated in 1948. Editor, Charles H. Fairbanks. Subscription included in dues of $3.00 per year. Members receive a *Newsletter* and the *Publications*, a memoir series issued irregularly as material and finances warrant. Send applications to Hale G. Smith, Box 3051, Florida State University, Tallahassee, Fla.

Southern Indian Studies. Published jointly by the North Carolina Archeological Society and the Laboratory of Anthropology and Archeology of the University of North Carolina. Editor, Joffre Coe. Publication initiated in 1949 with one or more numbers distributed per year. The most recent issue was Vol. 7, dated October, 1955. Subscription included in dues of $2.00 per year to the North Carolina Archeological Society; institutional and nonresident subscription, $1.00. Applications should be sent to Box 561, Chapel Hill, N.C.

Newsletter, Southeastern Archeological Conference. Journal of the Southeastern Conference, initiated in 1939, with normally one or more numbers distributed per year. Subscription, $1.00 per year, should be sent to William Haag, Department of Geology, Louisiana State University, Baton Rouge, La.

Tennessee Archaeologist. Published semiannually by the Tennessee Archaeological Society, 6 Biology Building, The University of Tennessee, Knoxville, Tenn. T. M. N. Lewis and Madeline Kneberg, Editors. Publication initiated in 1944. Subscription by membership, annual dues, $3.00.

Quarterly Bulletin, Archeological Society of Virginia. Editor, Colonel Robert P. Carroll, Virginia Military Institute, Lexington, Va. Current issue, Vol. 12, No. 1 (Sept. 1957). Mimeographed, with illustrations. Subscription by membership, annual dues, $3.00. Treasurer, Fred H. Morgan, Jr., 3809 Hawthorne Ave., Richmond 22, Va.

The West Virginia Archeologist. Published irregularly by the West Virginia Archeological Society. Annual dues, $2.00. Editor, Delf Norona, 315 Seventh Street, Moundsville, W. Va. Clifford M. Lewis, S.J., Secretary-Treasurer, Wheeling College, Wheeling, W. Va.

News Letter, Archeological Society of Maryland. Mimeographed monthly containing general information, meeting reports, speaker transcripts, and brief site reports. Members also receive a *Bulletin*, published irregularly, but with one or more per year intended. Initial *Bulletin* (July, 1957) was "The Shepard Site Study" by MacCord, Schmitt, and Slattery. Active and institutional membership, $5.00. Send applications to Robert W. Hale, Secretary-Treasurer, 5004 Springlake Way, Baltimore 12, Md.

NORTHEAST

Researches and Transactions of The New York State Archeological Association. Published annually (or approximately) since 1918. Active membership, $3.00. Address all correspondence to Charles E. Gillette, Secretary, N.Y. State Archeological Association, N.Y. State Museum, Albany 1.

Bulletin of the Nassau Archeological Society. Vol. 1, No. 1, published in summer, 1955. Active membership, $3.00; associate and institutional, $1.00. Write to Nassau Archeological Society, P.O. Box 1026, Sea Cliff, N.Y.

Pennsylvania Archaeologist. Published quarterly since 1930 by The Society for Pennsylvania Archaeology. Active membership, $3.00. Applications should be sent to Vincent R. Mrozoski, Secretary-Treasurer, 407 Phillips St., West Aliquippa, Pa.

Bulletin of the Massachusetts Archaeological Society. Published quarterly since 1939. Active membership, $3.00. Send requests to Mabel Robbins, Secretary, Bronson Museum, 8 North Main Street, Attleboro, Mass.

The New Hampshire Archeologist. Published intermittently since the formation of the New Hampshire Archeological Society in 1947. Active membership, $3.00. Inquiries for publications or membership should be addressed to William B. Fisher, Secretary-Treasurer, 72 Pine Street, Franklin, N.H.

The Archeolog. Publication of the Sussex Society of Archeology and History, Delaware (successor to the Sussex Archaeological Association). Managing Editor,

O. H. Peets, Millsboro, Del.; Custodian of Records, Catherine Maull, Lewes, Del. Current issue, Vol. 9, No. 1 (May, 1957). Mimeographed and photo-offset, with illustrations. Active membership, $3.00; institutional, $2.00.

Bulletin of the Archeological Society of New Jersey. Published annually or semiannually by the Society since 1948. Regular membership, $3.00. Send applications to Kathryn B. Greywacz, Secretary, New Jersey State Museum, Trenton, N.J.

Bulletin of the Archeological Society of Connecticut. Published annually or more often (no fixed time of publication) by the Society since 1935. Regular membership, $2.00. Editor, Thomas W. Schenarts, Yale Peabody Museum, New Haven, Conn.

Bulletin of the Eastern States Archeological Federation. Published annually (approximately) since 1941. Distributed through membership in one of the affiliated archaeological societies (Ala., Conn., Del., Fla., Ga., Md., Me., Mich., N.H., N.J., N.Y., N.C., Pa., R.I., Va., W.Va., Ontario, Manitoba, and Quebec, Canada). Kathryn B. Greywacz, Corresponding Secretary, New Jersey State Museum, Trenton, N.J.

Northern Mississippi Valley

Central States Archaeological Journal. A quarterly journal, initiated in 1954, which supplants the previously listed *Journal of the Illinois State Archaeological Society.* Subscription by membership in one of the component societies. Send dues of $3.00 per year to appropriate society as follows: Illinois Society — Ed Meiners, 219 Westwood Place, East Alton, Ill.; St. Louis Society — Robert J. Schmidt, 2211 Gravois, St. Louis, Mo.; Indiana Society — Cameron Parks, 400 So. Walsh, Garrett, Ind.

The Ohio Archaeologist. Quarterly publication initiated in 1951 to succeed the *Bulletin of the Ohio Indian Relic Collectors Society.* Editor, H. C. Wachtel. Annual subscription, $3.00, applications to be sent to the Secretary-Treasurer, Arthur George Smith, 65 North Foster Street, Norwalk, Ohio.

The Missouri Archaeologist. Published quarterly by the Missouri Archaeological Society since 1935 (partial volumes issued in early years). Annual membership, $2.00. Send applications to Richard O. Keslin, Editor and Secretary-Treasurer, 15 Switzler Hall, University of Missouri, Columbia, Mo. The Society also issues occasional *Memoirs* and a monthly *Newsletter,* which are included in dues.

The Minnesota Archaeologist. Published quarterly by the Minnesota Archaeological Society with headquarters at the Science Museum, Minneapolis Public Library, 1001 Hennepin Avenue, Minneapolis 3, Minn. Mimeographed, with illustrations. Publication initiated in 1935. Subscribing membership, $2.00, Active, $3.00. Secretary, C. W. LaVictoire, 5328 Ewing Avenue South, Minneapolis, Minn.

The Wisconsin Archeologist. Published quarterly by The Wisconsin Archeological Society. Twenty volumes of the old series published between 1901 and 1921. Vol. 1, No. 1 of the new series initiated January, 1922. Editor, Robert E. Ritzenthaler. Annual membership fee $2.00. Send applications to Phil H. Wiegand, Secretary, 1276 N. 63rd Ct., Wauwatosa 13, Wis.

The Totem Pole. Bulletin of the Aboriginal Research Club, Detroit, Mich. Current volume, No. 40 (1957). Membership dues, $1.00 per year; $1.50, if the *Totem Pole* is to be mailed. Editor, D. J. Richards, 6584 Balfour, Allen Park, Mich.

Journal of the Iowa Archeological Society. Published quarterly by the Iowa Archeological Society since October, 1951. Editor, Reynold J. Ruppé. Active membership, $4.00. Send applications to W. D. Frankforter, Secretary-Treasurer, Sanford Museum, Cherokee, Iowa. Subscription to the *Newsletter of the Iowa Archeological Society* also included in dues.

Michigan Archaeologist. A multilithed quarterly published by the Michigan Archaeological Society. Editor, Emerson F. Greenman, Museum of Anthropology, University of Michigan, Ann Arbor, Mich. Subscription by membership in the society; dues of $2.00 per year should be sent to Birt Darling, 1508 West Lenawee, Lansing 15, Mich.

Plains

The Plains Anthropologist. A journal, initiated in May, 1954, and published irregularly as a successor to the *Plains Archeological Conference News Letter.* Editor, Franklin Fenenga. Send subscriptions of $2.00 per year to editor, Laboratory of Anthropology, University of Nebraska, Lincoln, Nebr.

Bulletin, Texas Archeological Society. Published annually since 1929 (between 1929-1952 as *Bulletin, Texas Archaeological and Paleontological Society*). Membership, $5.00 per year. Editor, E. Mott Davis, Department of Anthropology, University of Texas, Austin 12, Texas. Send subscription to Secretary-Treasurer, H. F. Sturgis, at same address. *Texas Archeology,* a newsletter of the Texas Archeological Society, initiated in 1957, included in subscription.

Bulletin, Oklahoma Anthropological Society. Annual publication initiated March, 1953. Membership, $3.00 per year. Send applications to Robert B. Hill, Secretary-Treasurer, 1537 South Delaware, Tulsa, Oklahoma. Subscription to the *Newsletter, Oklahoma Anthropological Society* included in dues. Nine issues per year distributed since publication was initiated in March, 1952.

Museum News. Newsletter of the W. H. Over Museum, University of South Dakota, Vermillion, S.D., containing frequent archaeological articles. Subscriptions $0.50 per year; issued monthly. Send applications to Wesley R. Hurt, Jr., Editor, at the Museum.

Central Texas Archeologist. Published occasionally as the official organ of the Central Texas Archeological Society, Waco, Texas. First published in 1936 as *CTAS Bulletin.* With Bulletin No. 3 name was changed to *Central Texas Archeologist.* Discontinued 1940-44; No.

5 issued in 1944, No. 6 in 1953, No. 7 in 1956, No. 8 currently being compiled. Financed by sale of copies, independent of Society membership. Price $3.50 per copy. Vols. 1 and 5 out of print. Each bulletin consists of from 2 to 8 papers and society notes, 32 to 112 pages. Deals primarily with unrecorded archaeological materials from Texas, with other related subjects at times. Order from Central Texas Archeologist, Frank H. Watt, Editor, Box 1176, Waco, Texas. *CTAS Newsletter* was published monthly during 1939 through 1941. No copies are available at this time.

Southwest

El Palacio. A bimonthly review free to members of the Archaeological Society of New Mexico (dues $5.00 a year), and New Mexico members of the Archaeological Institute of America (dues $10.00 a year). Publication initiated, 1913. Order from Museum of New Mexico, Santa Fe, N.M.

The Kiva. Quarterly journal, initiated 1935, of the Arizona Archaeological and Historical Society. Annual membership, $3.00; student membership, $1.50; subscription, $1.00. Order from the society, Arizona State Museum, University of Arizona, Tucson, Ariz.

The Masterkey. Published 6 times a year since 1927 by the Southwest Museum, Highland Park, Los Angeles, California. Regular membership, $7.50; subscription rate, $2.50 per year.

The Museum News, Texas Technological College. Published quarterly since June, 1950, by The West Texas Museum Association. Cost of regular membership, $2.50 annually. Order from The Museum, Tech Station, Lubbock, Texas.

Plateau. Published quarterly by the Museum of Northern Arizona, Box 402, Flagstaff, Arizona. Began publication in 1930 under name *Museum Notes* which was issued monthly until June, 1939 (Vol. 11, No. 12) when name was changed. Regular membership, $5.00; institutional, $2.00. Order from Museum.

Southwestern Lore. Quarterly journal published since 1935 by the Colorado Archaeological Society. Regular membership, $1.50. Send applications to Joe Ben Wheat, Exec. Secretary, University of Colorado, Boulder, Colo.

Tree-Ring Bulletin. Published quarterly by the Tree-Ring Society since July, 1934. Volumes also appear as single numbers. Regular and institutional membership or subscription, $2.00. Order from Managing Editor, Tree-Ring Bulletin, University of Arizona, Tucson, Ariz.

Far West

Papers, Archaeological Survey Association of Southern California. Appear irregularly as material and finances permit; 2 numbers published since 1955, others in press. Prices variable; for information address the editor, the Southwest Museum, Los Angeles.

Newsletter, Archaeological Survey Association of Southern California. Appears quarterly, subscription by membership ($2.00 annually) in Archaeological Survey Association of Southern California. Started 1955. Applications should be sent to secretary of the ASA, Southwest Museum, Los Angeles.

Contributions to California Archaeology. Appears irregularly as material and finances permit. Started 1956; 2 numbers published to date. Published by Archaeological Research Associates, a student group at the University of Southern California, Los Angeles 7. For information address W. J. Wallace, Dept. of Anthropology, University of Southern California.

Utah Archeology. Quarterly newsletter of the Utah Statewide Archeological Society. During 1955 and 1956 it was published and distributed free by the Department of Anthropology, University of Utah. Starting with 1957 annual membership was set at $1.00. Send applications to James H. Gunnerson, University of Utah, Salt Lake City, Utah.

Middle America

Acta Anthropológica. Published by the *Sociedad de Alumnos, Escuela Nacional de Antropología e Historia*, Mexico. Appears irregularly. Each number is a monograph, a thesis presented at the School of Anthropology. Four numbers compose a volume. Costs $3.00 (U.S.) per volume. Last number issued in 1956. Address *Acta Anthropológica*, Moneda 13, México D.F., Mexico.

Antropología e Historia de Guatemala. Publication of the *Instituto de Antropología e Historia*, Guatemala. Two issues a year comprise a volume, that for 1957 being Vol. 9. Cost $2.50 (U.S.) per volume. Address: Instituto de Antropología e Historia, Edificio No. 5 de "La Aurora," Guatemala, C.A.

El Mexico Antiguo. Journal of the *Sociedad Alemana Mexicanista*. Appears irregularly, in recent years as complete volumes; Vol. 8 is dated 1955. Subscription is by volume at $5.00 (U.S.). Address: Apartado 318, México D.F., Mexico. Contains many short articles on archaeological subjects.

Informes. A new series published by the *Dirección de Monumentos Prehispánicos* of the *Instituto Nacional de Antropología e Historia*. Up to about 40 pages each in length, the series is devoted mainly to preliminary reports on excavations. Appears irregularly in a numbered series, the last being No. 5, 1956. Address: Instituto Nacional de Antropología e Historia, Cordoba 45, México D.F., Mexico.

Mesoamerican Notes. A numbered series appearing irregularly, published by the Department of Anthropology of Mexico City College. Five numbers have appeared; No. 5 in 1957. Numbers are variously priced and contain short and longer articles devoted to the Department's research projects, in English. Address: Department of Anthropology, Mexico City College, Kilómetro 16, Carretera Mexico-Toluca, Mexico 10, D.F., Mexico.

Revista Mexicana de Estudios Antropológicos. Published by the *Sociedad Mexicana de Antropología*. First 2 volumes appeared as *Revista Mexicana de Estudios Históricos* in 1927-28. The most recent issue is Vol. 14,

dated 1954-55. Consists of shorter articles devoted to Mexican archaeology, ethnology, and linguistics. Subscription is by volume, $2.50 (U.S.). Address: *Sociedad Mexicana de Antropología*, Moneda 13, México D.F., Mexico.

Tlalocan, "A Journal of Source Materials on the Native Cultures of Mexico." Last issue was Vol. 3, No. 3, 1952. Is now published with the collaboration of the San Jacinto Museum of History and the Instituto Nacional de Antropología of Mexico. Devoted to 16th century written sources on the native cultures. Address: La Casa de Tlaloc, Cuevas Rubio 65, México D.F., Mexico.

Tlatoani, Boletín de la Sociedad de Alumnos de la Escuela Nacional de Antropología e Historia. Contains short articles and news. Publication often delayed and irregular; last issue, June 1956. Subscription, $2.50 (U.S.) per year. Address: *Tlatoani*, Escuela Nacional de Antropología, Moneda 13, México 1, D.F., Mexico.

Yan. Official organ of the *Centro de Investigaciones Antropológicas de México*. Shorter articles on archaeology and other anthropological subjects, well illustrated. Last issue dated 1954. Subscription is for 2 or 3 numbers with a total of 200 pages, $3.00 (U.S.). Address: Yan, Apartado 2242, México D.F., Mexico. The C.I.A.M. also issues a shorter *Boletín* with news of its activities and items of general archaeological interest.

South America

Argentina. *Archivos Ethnos*. Annual. Address, Casilla 2591, Buenos Aires.

Revista del Instituto de Antropología. Annual, published by Universidad Nacional de Tucumán, Calle Buenos Aires 260, Tucumán.

Revista del Museo de la Universidad de la Plata. Published at irregular intervals by the Museo de la Plata, La Plata.

Revista de la Universidad Nacional de Córdoba. Annual, published at the University in Córdoba.

Runa, Archivo para las Ciencias de Hombre. Annual, published by Universidad de Bueons Aires, Instituto de Antropología, Moreno 350, Buenos Aires.

Brazil. *Revista do Museu Paulista*. Annual, with infrequent articles on archaeology. Museu Paulista, Caixa Postal 8032, São Paulo.

Chile. *Boletín del Museo y de la Sociedad Arqueológica de la Serena*. Published at irregular intervals by Museo de la Serena, Casilla 125, La Serena.

Revista Universitaria. Annual. Universidad Católica de Chile, Santiago.

Colombia. *Boletín del Instituto de Antropología*. Biennial. Address, Calle 48, No. 42-17, Universidad de Antioquia, Medellín.

Revista Colombiana de Antropología. Biennial. Instituto Colombiana de Antropología, Apartado Nacional 407, Bogotá.

Cuba. *Revista de Arqueología y Etnología*. Quarterly, published by Junta Nacional de Arqueología y Etnología, Oficina del Historiador de la Ciudad, Plaza de la Catedral, Habana.

Ecuador. *Boletín de Informaciones Científicas Nacionales*. Quarterly. Address, Casa de la Cultura Ecuatoriana, Quito.

Peru. *Arqueológicas, Publicaciones del Instituto de Investigaciones Antropológicas*. Issued irregularly. Museo Nacional de Antropología y Arqueología, Magdalena Vieja, Lima.

Chimor. Published irregularly by Museo de Arqueología, Universidad Nacional de Trujillo, Apartado 110, Trujillo.

Revista del Museo e Instituto Arqueológico. Published irregularly by Universidad Nacional del Cuzco, Calle Tigre No. 8, Cuzco.

Revista del Museo Nacional de Antropología y Arqueología. Annual publication of the Museum, Magdalena Vieja, Lima.

Venezuela. *Boletín del Museo de Ciencias Naturales*. Quarterly. Museo de Ciencias Naturales, Apartado de Correos 3893, Caracas.

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Heizer, R. F. and Franklin Fenenga
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